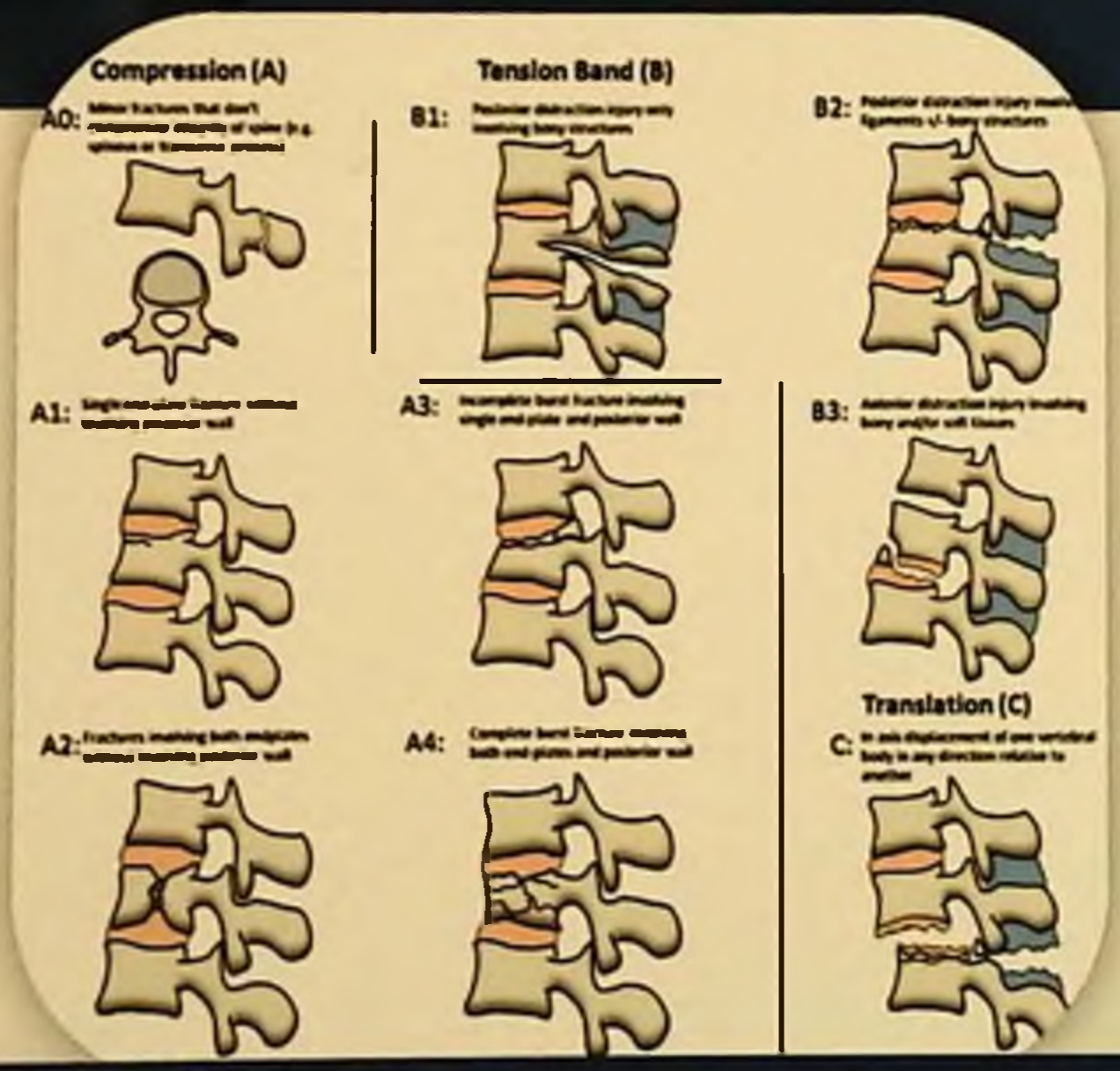
MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN
CENTER FOR THE DEVELOPMENT OF MEDICAL EDUCATION
SAMARKAND STATE MEDICAL INSTITUTE
DEPARTMENT OF THE NEUROSURGERY

TRAUMATIC INJURY OF THE SPINAL COLUMN AND SPINAL CORD



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TRAUMATIC INJURY OF THE SPINAL COLUMN AND SPINAL CORD

Educational and methodological manual for students of the V, VI courses of the pediatric, medical and medical-pedagogical faculties, residents of the magistracy and clinical residents of medical higher educational institutions

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Educational and methodological manual for students of the V, VI courses of the pediatric, medical and medical-pedagogical faculties, residents of the magistracy and clinical residents of medical higher educational institutions

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Annotation. *The main theoretical issues related to injuries of the spine and spinal cord are highlighted. The anatomy of the spine and spinal cord, etiology, pathogenesis, clinic, diagnosis and differential diagnosis of spinal cord injuries are described in detail. Modern methods of treatment are given.*

These manual are written taking into account the above and will further strengthen the knowledge of students, graduate students, clinical residents about the epidemiology, etiology, clinic, modern diagnosis and treatment of spinal cord and spinal cord injuries and their consequences.

The manual includes test questions and situational questions to test students' knowledge. Methodological recommendations are intended for residents, clinical residents and senior students of medical universities.

The teaching Educational and methodological manual was reviewed and approved by the Academic Council of Samarkand State Medical University.
Protocol No. 9 "25" 04 2023 year.

Secretary of the Academic Council: **Ochilov U.U.**

CONTENT

Timetable of classes

№.	Stages of learning	Location	Time
1.	Participation in the morning conference	Course conference room	40 minutes
2.	Organizational activity	Audience	30 minutes
3.	Checking students' knowledge on a topic	Audience	60 minutes
4	Discussion of supervised patients	Ward of patients	40 minutes
5.	Discussion of the topic of the lesson	Audience	30 minutes
6.	Checking students' knowledge	Audience	60 minutes
7.	Control of assimilation of material	Audience	30 minutes
8.	Checking students' knowledge	Audience	20 minutes
9.	Room for studying situational tasks and practical skills	Audience	40 minutes
10.	Introducing the next lesson	Audience	10 minutes

The purpose of the course is to provide medical students, residents and clinical residents with knowledge about injuries of the spine and spinal cord, their etiopathogenesis, clinical features, classification criteria, achievements in modern diagnostics, principles of conservative and surgical treatment.

Career guidance for students. injuries of the spine and spinal cord are still relevant today. This type of injury is more common in the relatively young, working population of the world. injuries of the spine and spinal cord limit the quality of life and performance of patients and can lead to various complications. injuries of the spine and spinal cord, knowledge of the clinic of its consequences and timely diagnosis, the use of appropriate methods of treatment can reduce the complications of the disease and increase the effectiveness of treatment.

How to do it

Algorithm for communication between students and patients related to the topic under consideration and any other topic (communication skills):

1. Greet patients and introduce yourself.
2. A sincere smile on the faces of students ensures reliable communication with patients.
3. The student should treat the patient well, explain why he came and how long the conversation will last, and also get the patient's consent to the conversation.
4. If the patient is now hospitalized, he should have a brief conversation with his relatives and, together with the attending physician, inform the patient of the initial diagnosis, the purpose of hospitalization, and the methods of future examinations.
5. Prior to conducting a physical examination for the diagnosis of this disease, the patient must be informed about the method of examination, adverse events that may be observed during the examination, and the consent of the patient to conduct this examination..
6. It is necessary to warn the patient before transporting the patient to another place for examination (X-ray room, MRI or MSCT study).
7. Preparation for examination (for clinical and neurological examination of this pathology) - wash hands with warm water and soap, put on gloves.
8. Carry out scheduled examinations and medical manipulations.
9. The results of examinations necessary for the patient should be briefly explained to the attending physician.
10. Relatives of patients should also be interviewed and the results of the screening method should be explained in a form convenient for them (if they have previously been tested, compared with previous results) and at the end of the interview it is desirable to make sure that the patient's condition is clear.
11. Substantiate and prove the expediency of surgical treatment of the supervised patient in the presence of the attending physician (mandatory!).
12. After surgical treatment, the patient and his relatives should be informed only in the presence of the attending physician about the outcome of the operation and possible early postoperative complications.

13. When examining patients in the postoperative period, the patient should be explained the procedure for the correct implementation of hygiene measures.

14. The patient should be treated in a pleading tone and consented to participate in the process of dressing the surgical wound.

15. Together with the attending physician, the patient should be informed about the ongoing and planned manipulations and further treatment tactics for the next of kin of the patient, if necessary.

16. It is always desirable to end the conversation with a wish to the patient for a speedy recovery.

The student must know:

1. Anatomical, topographic and physiological features of the spine;
2. Etiology, pathogenesis, classification of injuries of the spinal cord;
3. Clinical characteristics of spinal cord injuries and methods for preventing their complications;
4. Indications and contraindications for injuries of the spinal cord;
5. Surgical interventions for vertebral and spinal cord injuries of various localization;
6. Classification of the etiopathogenesis of complications of the spinal cord injuries;
7. Clinic, diagnostics, differential diagnostics of the spinal cord injuries;
8. Indications and contraindications for conservative or surgical treatment of the spinal cord injuries, features of preoperative preparation;
9. The main features of the surgical treatment of the spinal cord injuries, the correct choice of surgical method and volume;
10. Preoperative and postoperative complications, their prevention, methods of treatment, principles of patient management in the postoperative period;
11. Principles of rehabilitation and examination of disability in operated patients with spinal cord injury;

The student must be able to:

1. Collection of anamnesis of patients with spinal cord injury;
2. Conduct a clinical and neurological examination and identify the main clinical signs of damage to the spine and spinal cord;

3. Develop a plan for instrumental and laboratory studies, an accurate analysis of test results, initial diagnosis, patient management tactics, a comprehensive examination with pathologists;

5. Clarification and formulation of a clinical diagnosis, preparation for emergency or planned surgical treatment.

6. Determine the indications and contraindications for surgical treatment, depending on the form and localization of the spinal cord injury, preoperative preparation, type of anesthesia, the correct choice of surgical treatment;

7. Postoperative patient care, bandage replacement;

8. Maintaining medical records when supervising patients;

9. The use of educational and scientific literature, advanced training in the performance of professional tasks.

TRAUMATIC INJURY OF THE SPINAL COLUMN AND SPINAL CORD

Purpose of the lesson: In this lesson, students, clinical residents, residents of the magistracy, practitioners will study the classification, features of etiopathogenesis, clinical manifestations, modern diagnostic methods, methods of transportation, tactics of conservative and surgical treatment of patients with injuries of the spine and spinal cord.

To classification, clinic, diagnostic and treatment methods

Spine and spinal cord injuries in peacetime account for 0,7-4,0% of all injuries, mainly men (75,0%) and people of the most able-bodied (20-50 years) age, from 59 to 88 % there are complicated (with compression of the spinal cord) injuries, in such cases, mortality reaches 21-23%, disability - 67-73% (A.V. Bondarchuk, 1958, V.M. Ugryumov, 1979, A.V. Livshits, 1990).

Closed spinal injuries are most often localized at the level of 4-6 cervical, 11-12 thoracic and 1-2 lumbar vertebrae. Fractures of the upper thoracic vertebrae up to 100% of cases are accompanied by compression of the spinal cord, and complicated injuries with fractures of the lower thoracic and lumbar spine occur in 30-70% (K. Arseni, 1973, E.I. Babichenko, 1979, A.P. Yumashev, 1984, A.V. Livschits, 1990, H. H. Khudoyberdiev, 1999).

Complicated spinal fractures are often accompanied by spinal shock, impaired sensation, movement and function of the pelvic organs. Medical students must acquire in-depth knowledge of the diagnosis and first aid for patients with spinal injuries.

Morphogenesis of the spinal cord injury

Morphogenesis of structural changes in spinal cord injury includes: 1) processes of disintegration, elimination and organization in the primary foci of injury; 2) reactions of border and distant tissues to vascular and trophic disorders (secondary necrosis, myelitis, glial reaction, development of granulation tissue); 3) ascending and descending degeneration of nerve fibers and pathways; 4) complications of dyscirculatory syndrome; 5) complications associated with dysfunction of the spinal cord (cystitis, pyelonephritis, bedsores, pneumonia, etc.).

During PSMT, 5 periods of morphogenesis are distinguished, in which there is a consistent dynamics of destructive, dystrophic and regenerative processes.

Initial acute period: necrotic and necrobiotic changes in the stroma and parenchyma of the spinal cord are determined in the area of damage.

Morphological changes develop in the period from several minutes to 2-3 days.

Early period: cleansing of foci of primary traumatic necrosis, hyperplasia of microgliocytes, drainage forms of oligodendrogliocytes, multiplication of phagocytes, the appearance of newly formed vessels. Above and below the site of injury - chromatolysis and death of neurons, the appearance of ischemic neurons, neurons with signs of primary axonal irritation (transneuronal changes). In the gray matter, foci appear - ganglionic desolation, in the white matter - destructive changes in nerve fibers and nerve bundles, signs of regeneration appear on some fibers - growth flasks. The duration of the period is up to 2 weeks.

Intermediate period: defect organization, initial formation of a connective tissue scar, astrocyte hyperplasia, cyst formation, a clear manifestation of transneuronal reactions from neurons, an increase in axonal outgrowths with signs of growth cones at the ends. The duration of the period is up to 3 months.

Late period: the final phase of scarring and cyst formation; on the one hand, the elimination of primary complications of a dyscirculatory nature, on the other hand, the emergence of new neurodynamic disorders. The duration of the period is up to a year.

Residual period: phase progression of pathological changes in neurons, nerve conductors and interneuronal connections, both destructive and reparative. There are signs of plastic rearrangements of the glioneuronal complex. The centers of injury are organized and cleared the fastest, then secondary necrosis. The latter include secondary systemic degenerations of nerve fibers, which are often promoted by cicatricial processes, edema and swelling of the brain, and inflammation.

A characteristic sign of a traumatic disease of the spinal cord is extensive widespread and long-lasting acute and secondary edema. The edema is most pronounced when the thoracic spinal cord is damaged, while when the cauda equina is damaged, it is unsharp and unstable. Edema can spread up and down from the lesion, has a patchy appearance; may appear during certain periods of trauma. Post-traumatic cysts are localized in the area of injury, as well as 4-6 segments more cranial or caudal, mainly in the dorsal parts of the spinal cord. As a rule, they have no messages with the central channel. The timing of the onset of formation and formation of post-traumatic cysts of the spinal cord are different. Experimental data showed that microcysts are formed already by the 6th day of PSCI and end by 2.5-3

months; at the site of ischemic necrosis, cyst formation is delayed for months and years.

Pathomorphological studies of the brain in remote periods after PSCI show destructive and compensatory processes in various parts of the brain. After 6, 12 or more years, changes in the glioneuronal index are observed in the motor neurons of the spinal cord and in field 4, which is regarded as a transition of individual micro- and macrolevels of the spinal cord and brain to a new mode of functioning developed by the CNS in response to its distant injury.

Pathological studies indicate a staging change in the structures of the CNS in PSCI, which have certain dynamic phases of compensation and decompensation, the outcome of which depends on numerous factors (the level and size of the lesion, the time since PSCI, the features of the treatment used, the addition of secondary complications, etc.).

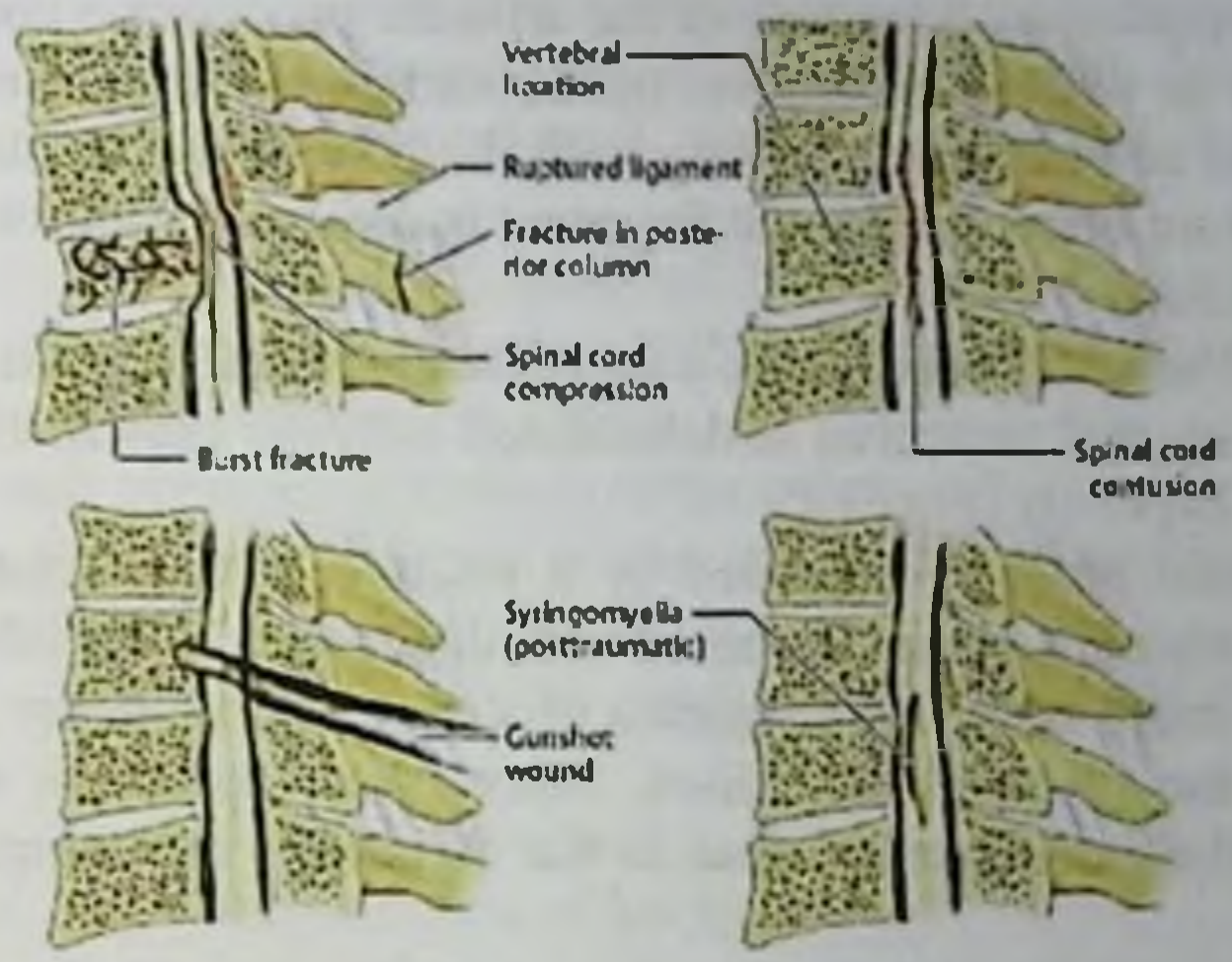
Classification of injuries of the spine and spinal cord

The most reasonable classification of injuries of the spine and spinal cord is currently divided into open (with violation of the integrity of the skin) and closed (without violation of the integrity of the skin) injuries. Closed injuries of the spine and spinal cord are divided into 3 groups: spinal injuries without dysfunction of the spinal cord, spinal injuries with dysfunction of the spinal cord, injuries of the spinal cord and its roots without damage to the spine.

In addition, various classifications of injuries of the spine and spinal cord have been proposed - D.G. Goldberg (1952), I.Ya. Razdolsky (1952), A.M. Shkolovsky (1956), Z.V. Bazilevskaya (1962), N.S. Kosinskaya (1964). However, these classifications have a number of shortcomings and therefore have not found wide practical application, although they complement each other. In most patients, the displacement of the bodies of the spine is combined with fractures of the body, arch, articular processes. Depending on the nature of the injuries, bruises, fractures, dislocations, fracture -dislocations or fractures with displacement, stretching and rupture of the associated apparatus, tearing of the end plates, damage to the intervertebral discs with a herniated disc protrusion and spongy substance of the vertebral body (Schmorl's hernia) or the cavity of the vertebral channel.

And there are also classifications according to the nature of damage to the anatomical structures of the spine, according to the localization of damage to the spine and spinal cord, according to damage to the spinal cord

itself. Ya.L. Tsivyan (1966) considers it appropriate to distinguish between stable and unstable spinal injuries. They depend on the types of violence applied to the vertebrae. The author divides them into 4 groups: flexion, flexion with rotation, extension, violence applied along the long axis of the spine (Fig. 1.).



Rice. 1. Types of spinal injury

In the first case, wedge-shaped compression usually occurs, which is more often a stable fracture. In the second type of damage, the integrity of the posterior ligaments is often violated, fractures of the articular processes occur, i.e. unstable damage occurs. In the extensor mechanism of violence (which is more common in the cervical spine), the posterior ligamentous apparatus is usually not damaged and such injuries are among the stable ones. In the fourth type of violence, comminuted penetrating fractures of the vertebral bodies are usually observed, usually accompanied by separation of the posterior sections of the vertebral bodies and their introduction into the lumen of the spinal canal. These fractures are stable because the ligaments are usually not damaged.

The changes observed in compression fractures are well known and are characterized by a decrease in the height of the vertebral body to one degree or another, its wedge-shaped deformation, and the presence of one or more fragments. The integrity of the closing plate of the cranio -spinal vertebra is more often violated. Often, in compression fractures, one or more fragments can be observed detached from the vertebral body. They are also characterized by damage to the intervertebral disc, the introduction of its

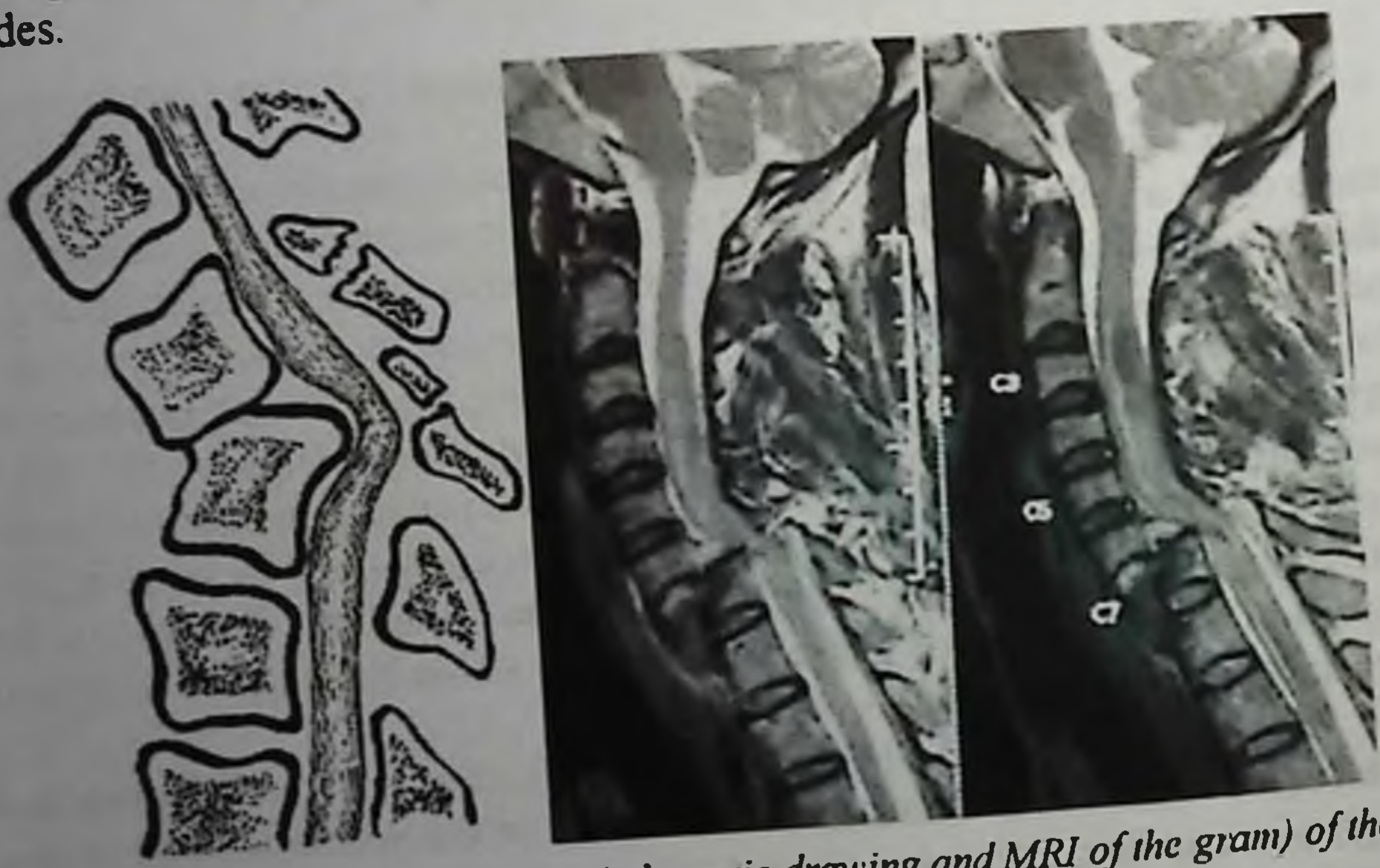
vertebral body with appropriate compression of the body, or a fracture of the anterior parts of the vertebral body.

A more complex type of spinal injury should include fractures, dislocations or luxation fractures. For this lesion, in addition to damage to the vertebral body, a rupture of the ligamentous apparatus is characteristic, often accompanied by a fracture of the articular processes, vertebral arches, dislocations or under dislocations of the vertebrae. As a result, there is a displacement of one vertebra along with the corresponding disc relative to the other. More often, the caudal fragment is displaced backward and in the cranial direction.

With fracture -dislocations, a decrease in the height of the body of one vertebra or several vertebrae is determined with the presence of traumatic scoliosis or kyphosis (Fig. 2.).

A special place is occupied by a fracture of the odontoid process, epistrophy, which is often combined with dislocation of the atlas.

Much more often than injuries of the vertebrae, injury occurs with damage to the intervertebral discs. More often, the result of traumatic damage to the intervertebral disc is the formation of traumatic Schmorl nodes.



Rice. Fig. 2. Fracture dislocation (schematic drawing and MRI of the gram) of the C7 segment of the spine

Epiduritis is often the result of a traumatic injury to the spine. Of great clinical interest are traumatic posterior herniated discs.

Herniated prolapsed intervertebral discs are diagnosed using various radiological techniques and artificial contrast, including MRI.

According to the classification developed during the Second World War and improved later, among the traumatic injuries of the spinal cord, there are: concussion, bruise, compression, crush with partial violation of the anatomical integrity, which may be accompanied by compression of the spinal cord or complete interruption of the spinal cord, hematomyelia, ischemic lesions, epidural, subdural and subarachnoid hemorrhages, traumatic sciatica.

According to the classification of N.S. Kosinskaya distinguishes between the following types of injuries of the spine and spinal cord:

A. Penetrating wounds of the spine.

1. Through penetrating wounds of the spine:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

c) without neurological disorders.

2. Blind penetrating wounds of the spine:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

c) without neurological disorders.

3. Tangential penetrating wounds of the spine:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

c) without neurological disorders.

B. Non-penetrating wounds of the spine

1. Through non-penetrating wounds:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

c) without neurological disorders.

2. Blind non-penetrating wounds:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

c) without neurological disorders.

3. Tangential non-penetrating wounds:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots;

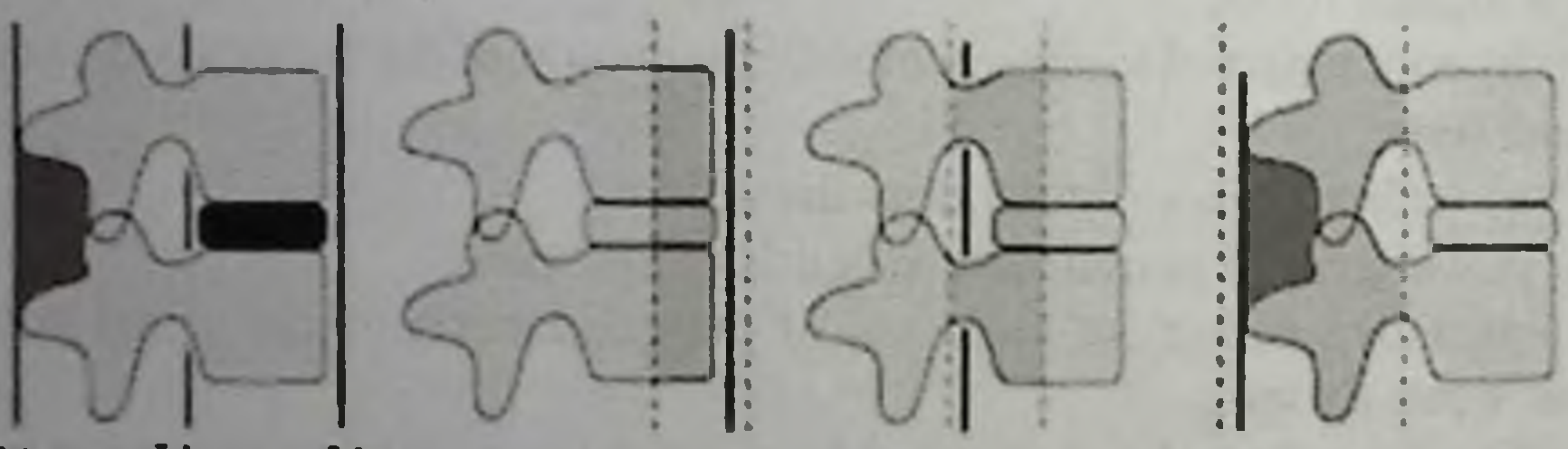
c) without neurological disorders.

B. Paravertebral wounds:

a) with a complete violation of the conduction of the spinal cord or cauda equina roots;

b) with a partial violation of the conduction of the spinal cord or cauda equina roots.

supported structure of the spine" is currently used, proposed by the American orthopedist F. Denis in 1981, according to which the spinal column is divided into three supporting structures - anterior, middle and posterior (Fig. 3.).



Rice. 3. Schematic representations of Denis's theory.

The anterior supporting structure includes the anterior longitudinal ligament, the anterior part of the fibrous rings of the discs, the anterior half of the vertebral bodies together with the disc; to the middle supporting structure - the posterior longitudinal ligament, the posterior part of the fibrous rings and the posterior half of the vertebral bodies with the disc; to

the posterior supporting structure - supraspinous, interspinous and yellow ligaments, joint capsules and vertebral arches.

Unstable injuries are those in which at least two supporting structures are damaged, namely the middle and back. Distinguish between absolute instability (occurs with a fracture of the vertebral bodies with damage to two articular processes and with dislocations of the vertebrae) and relative instability (with damage to the body and one articular process of the vertebra). With an unstable injury, as a result of a violation of the integrity of the supporting elements, displacement of the vertebrae relative to each other may occur, which is accompanied by the threat of compression of the spinal cord and its vessels.

Therefore, the diagnosis of spinal instability is very important for future treatment tactics. In unstable injuries, the question arises of the need for reliable external immobilization of the injured spine to prevent aggravation of spinal canal deformity.

Pathophysiology of spinal cord injury

When studying the pathophysiological mechanisms of injuries of the spine and spinal cord, the issues of spinal shock come to the fore, i.e. those reversible functional changes in the damaged spinal cord, which, according to modern concepts, are based on protective inhibition or a parabiotic state. It is known that spinal shock is a state of temporary inhibition of the reflex activity of the spinal cord caused by trauma. According to I.P. Pavlov, prolonged and excessive strong irritation leads to fatigue and exhaustion of nerve cells, as a result of which inhibition develops in them, preventing further exhaustion.

Changes in the functional state of the spinal cord in its injuries and diseases are not limited to the distal and proximal segments, but also occur in the higher parts of the CNS. This reflects the general pattern, which consists in the fact that excitation that occurs in the central nervous system can spread to the most distant parts of the body and in humans leads to a change in the state of other parts of the central nervous system that are functionally related to it.

Damage to the spinal cord and associated changes in the functional state of various, in particular the higher parts of the central nervous system, lead to dysfunction not only of the cardiovascular system, but also of other body systems. With a spinal cord injury, the corresponding sections of the analyzers of internal organs are directly damaged, which are located for a considerable distance within its limits. In the spinal cord, there are both

pathways that carry impulses from the internal organs to the higher parts of the central nervous system, and those pathways along which the regulatory influence of these departments is carried out. At the same time, it is known that the sensory nerve endings of the internal organs are directly connected with the spinal cord through the sensory fibers of its posterior roots. For example, after transection of the posterior roots of the lumbosacral spinal cord, degeneration of sensitive nerve endings of the bladder mucosa, mechanoreceptors and muscle receptors is observed.

Disorder of the functions of internal organs is often the earliest signal of a disease of the spinal cord. Erroneous operations on internal organs in diseases of the spinal cord are performed in approximately 6% of cases. Disorders of the functions of internal organs in injuries and diseases of the spinal cord were observed by N.N. Burdenko (1945), N.I. Grishenkov (1946), V.K. Khoroshko (1946), O.V. Nikolaev (1945), Yu.N. Savchenko (1954) and others.

Uncomplicated spinal shock lasts 15-20 days. Clinical observations show that spinal shock may be longer in humans. Patients get out of this state in an average of 4-8 weeks. after injury. The phenomena of spinal shock in humans can be maintained and deepened by exposure to various constant irritants (hematomas, bone fragments, metallic foreign bodies, scars) for many weeks, months and even years. Disorders of the cerebrospinal fluid and blood circulation, swelling of the spinal cord also aggravates the phenomena of spinal shock.

The study of the results of surgical treatment of spinal cord injuries indicates that the restoration of its temporarily lost functions occurs especially quickly after the elimination of spinal cord compression, i.e. after the elimination of exposure to such constant irritants as bone fragments, metal foreign bodies, hematomas, arachnoid adhesions and cysts, epidural scars, callus, etc. Based on this, any compression of the spinal cord must be removed surgically.

Spinal Injury Clinic

In the clinic of spinal cord injuries, motor, reflex, sensory disorders and dysfunction of the pelvic organs come to the fore. It is impossible to discount the violation of the functions of other vital systems of the body.

The clinic of spinal cord injuries is largely determined by the severity and extent of injuries of the spinal cord itself. Concussion, bruise, compression of the spinal cord, and hematomyelia stand out.

1. Concussion of the spinal cord. The pathophysiological basis of concussion of the spinal cord is mainly its functional changes in the form of parabiosis or transcendental inhibition. Clinically, this is characterized by the reversibility of pathological changes. The recovery period is short.

2. Spinal cord contusion - is a combination of pathomorphological changes (necrosis, hemorrhage, etc.) with functional changes such as parabiosis or transcendental inhibition (spinal shock). Clinically, immediately after the injury, paralysis and paresis occur, occurring with muscle hypotension and areflexia, sensitivity disorders, and dysfunction of the pelvic organs. The cerebrospinal fluid may contain blood. The patency of the subarachnoid space is usually not impaired.

Restoration of impaired functions in a spinal cord injury occurs mainly due to its recovery from the state of spinal shock, edema and swelling, etc. In severe injury, the restoration of motor and sensory functions of the pelvic organs begins on average by the 3rd week.

3. Compression of the spinal cord. IN AND. Grebenyuk (1959) proposes *to distinguish according to the time of development:*

a) acute compression of the spinal cord that occurs at the time of injury;

b) earlier compression - hours or days after the injury,

c) later, months or years later;

by localization:

a) posterior vertebral arch, epidural hematoma, torn ligamentum flavum;

b) anterior-body of a broken and mixed vertebra, prolapsed intervertebral disc;

c) internal-intracerebral hematoma, detritus in the focus of brain injury with swelling of the spinal cord,

according to the degree of compression:

a) complete - with a complete violation of the functions of the conduction of the spinal cord,

b) partial - with the preservation of the remnants of the conduction of the spinal cord, and finally,

according to the nature of development:

a) acutely progressive;

b) chronically developing;

c) stabilized.

Deserves some attention is the so-called dynamic compression of the spinal cord and its roots, which increases with certain movements of the spine and is usually more pronounced towards the end of the day.

4. Hematomyelia. As a result of hemorrhage in the gray matter of the spinal cord, tubular hematomyelia develops. The outflowing blood can spread through the central canal with subsequent destruction of the gray matter and compression of the pathways (Fig. 4.). As a result, with hematomyelia, a combination of segmental and conduction disorders occurs.

Rice. 4. Hematomyelia, epi- and subdural hematomas in spinal cord injury

Hematomyelia can lead to a transverse lesion of the spinal cord with the occurrence of paralysis and conduction disorders of sensitivity to a significant degree of damage along the diameter of the spinal cord. This is important because it gives an idea of the extent to which the spinal cord is compressed by the resulting hematoma. This clarifies the indications for its emptying.

5. Damage to the roots of the spinal cord. If symptoms of damage to the roots of the spinal cord occur after a spinal injury, it is more correct to talk about radiculitis and traumatic lesions of the roots, thereby distinguishing them from radiculitis of infectious origin, when the etiology, pathogenesis and pathomorphological changes confirm the presence of inflammatory processes. As can be seen, the division of damage to the spinal cord roots into primary and secondary is of practical importance in clarifying the indications for treatment.

Movement disorders. The severity and nature of movement disorders largely depend on the level of damage to the spinal cord. The increase in movement disorders in the first hours and days may be due to epi- and subdural hematoma, spinal cord edema, additional spinal cord injury caused by displacement of bone fragments or metal foreign bodies.

Restoration of movement in severe partial injuries of the spinal cord occurs no earlier than after 3-4 weeks. after injury. In most patients, motor function is restored earlier than sensitive. Restoration of movements may be suspended due to the formation of scars during the development of late complications in the form of arachnoiditis, epiduritis, meningomyelitis, spinal cord abscess.

As for the tone of the paralyzed muscles, immediately after the injury, it is sharply reduced in most patients with injuries of the spine and spinal cord. In severe injuries of the spinal cord, accompanied by widespread spinal shock, atony of the muscles of the paralyzed limbs occurs. With high injuries of the cervical and thoracic spinal cord, atony is gradually replaced by an increase in muscle tone. An increase in muscle tone in paralyzed limbs occurs simultaneously with the restoration of tendon and periosteal reflexes and the appearance of protective reflexes.

Thus, a correct assessment of motor disorders and changes in muscle tone of paralyzed and paralyzed limbs can help clarify the indications for surgical intervention and the choice of its form, and also helps to prevent diagnostic errors when specifying the severity of spinal cord injury.

Muscular hypotension with paralysis or paresis of the legs is characteristic of damage to the lumbar spinal cord, its cone and cauda equina.

Reflex disorder. The study of reflex activity disorders can be used to clarify the severity and level of damage to the spinal cord, and therefore, to determine the indications for surgical intervention. Tendon, periosteal and skin reflexes immediately after an injury disappear or sharply decrease, the lighter the damage to the spinal cord, the faster the reflexes are restored and vice versa. It should be emphasized that the restoration of reflexes also occurs during an anatomical interruption of the spinal cord.

The fact that skin reflexes in humans appear with the formation of cortical functions allows us to suggest that the restoration of abdominal reflexes during an anatomical interruption of the cortico -spinal pathways is due to the restoration of the regulatory influence of the cortex, which can be carried out along roundabout ways of innervation, in particular, the borderline sympathetic trunk.

Pathological reflexes are absent in the first days after the injury and appear the later, the more severe the spinal cord injury, sometimes after several weeks. In cases of predominance of reversible changes in the cortico -spinal tract, the Rossolimo reflex is observed, and in case of gross injuries, the Babinsky reflex (extensor reflexes) joins. Restoration of the functions of the spinal cord after appropriate treatment initially leads to the disappearance of pathological reflexes: extensor type - Babinsky, flexion reflexes last a long time (Rossolimo reflex).

Sensitivity disorders

Correct analysis of sensory disorders in spinal and spinal cord injuries is of great importance for topical diagnosis and in determining indications for surgical intervention. This is due to the fact that, by the nature of the degree of sensitivity disorder, it is possible to judge both the severity and the level of damage to the spinal cord.

Sensitivity disorders in injuries of the spine and spinal cord consist of segmental, conduction and radicular disorders. They can be in the form of anesthesia, hypesthesia, less often in the form of hyperesthesia. Uniform loss of sensitivity in both halves of the body with a predominance of the conductive nature of sensory disorders, even in patients with partial anatomical damage to the spinal cord along its diameter, is due to concomitant spinal shock.

Different types of superficial and deep sensitivity can be restored in different ways, depending on the localization of the spinal cord injury along the diameter. To determine the functional state of large vertebral-spinal cord injuries, the Frankel classification is used, consisting of 5 groups (Table 1.).

Table 1.

Assessment of the functional state of patients with spinal cord injury (according to Frankel)

Functional Class	Criteria for the patient's condition
Group A	Lack of sensation and movement below the level of injury
Group B	Incomplete loss of sensation below the level of injury, no movement
Group C	Incomplete loss of sensation below the level of injury, there are weak movements
Group D	Incomplete loss of sensation below the level of injury, muscle strength sufficient to walk with assistance
Group E	No sensory or motor disturbances

Great attention deserves the fact that during a temporary physiological interruption of the spinal cord, sensory disorders in the acute stage are less pronounced than motor ones. In patients with hematomyelia, dissociated sensitivity disorders can be observed - loss of superficial sensitivity according to the segmental type is not accompanied by noticeable disorders of deep sensitivity.

In addition to this classification, the ASIA classification has now been put into practice.

American Spinal Cord Injury Level and Severity Classification Spinal Injury Association (ASIA)

Until the early 1990s, there was no single generally accepted classification of the level and severity of spinal cord injury. Doctors often used different definitions of the level of injury, complete and incomplete injuries.

The spinal cord is located inside the spinal canal. Segmental levels of the spinal cord are determined by the anterior and posterior spinal roots, which connect to the spinal nerves near the intervertebral foramina.

There are 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1-3 coccygeal segments of the spinal cord (Fig. 5). The upper cervical segments are located at the level of the bodies of the cervical vertebrae corresponding to their serial number. The lower cervical and upper thoracic segments are one vertebra higher than the corresponding vertebral bodies. In the middle thoracic region, this difference is equal to two vertebrae, in the lower thoracic region, to three vertebrae.

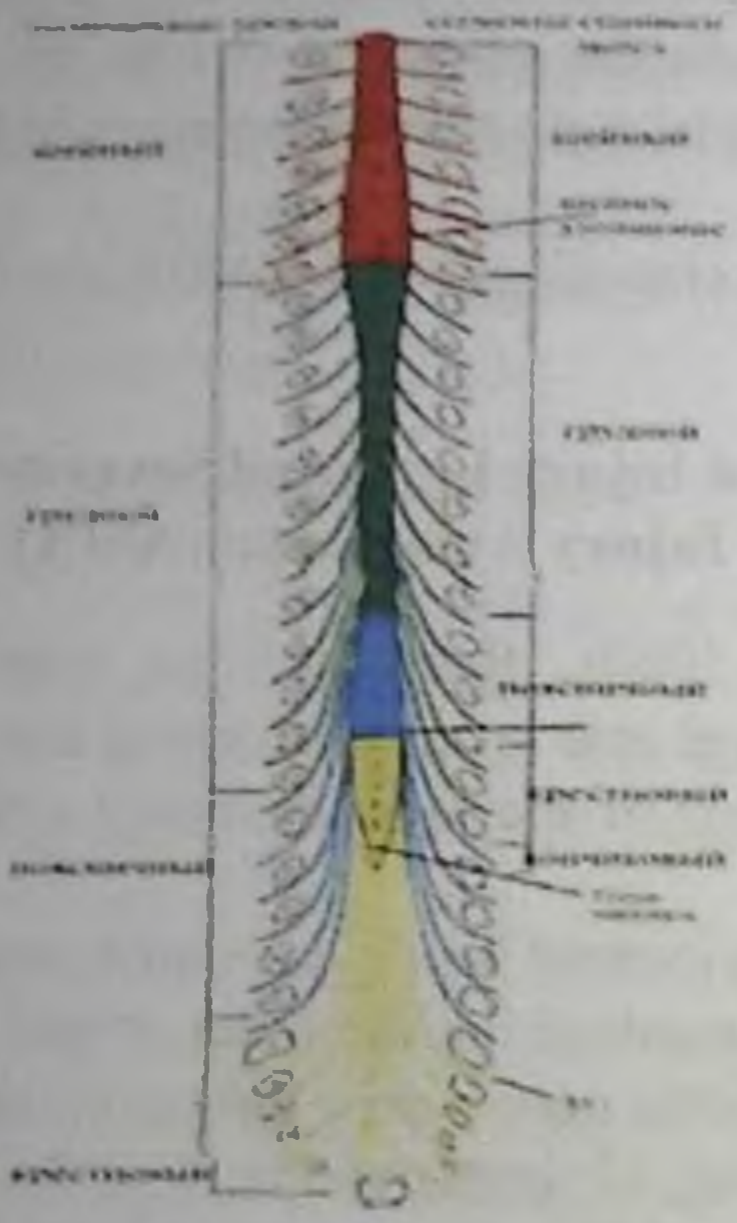
The lumbar segments are located at the level of the bodies of the tenth and eleventh thoracic vertebrae, the sacral and coccygeal segments correspond to the levels of the twelfth thoracic and first lumbar vertebrae. The lower border of the spinal cord tapering in the form of a cone is located at the level of the second lumbar vertebra.

Below this level is the terminal filament, which is the remnant of the final section of the embryonic spinal cord and is surrounded by the roots of the spinal nerves and the membranes of the spinal cord.

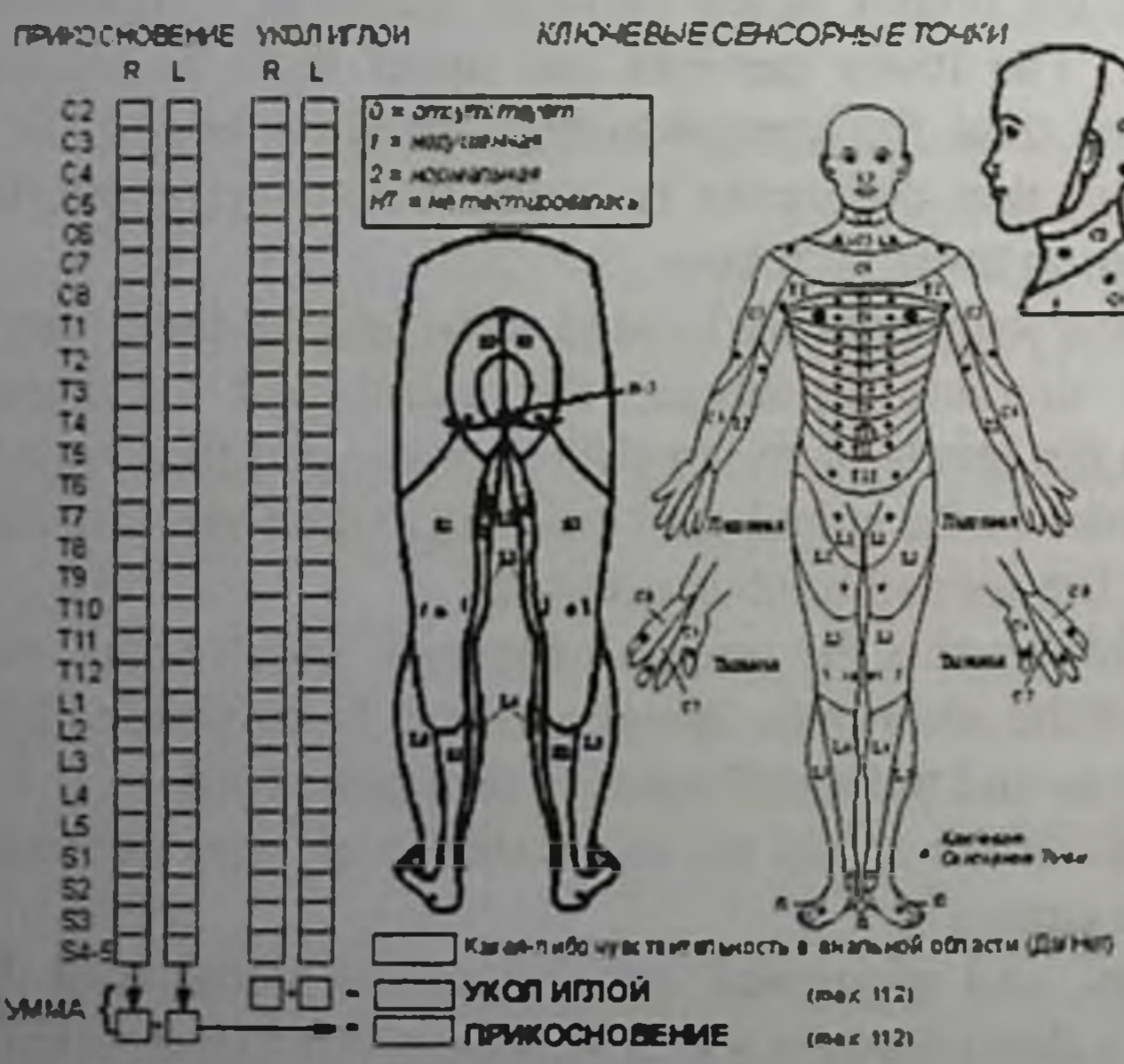
The roots of the spinal nerves at this level form the so-called cauda equina (cauda equina).

The spine and segmental division of the spinal cord. Sensory and motor levels, a dermatome is a skin area innervated by a certain segment of the spinal cord. Figures 6 and 7 show the dermatomes and key points for their definition, as well as the muscle groups recommended for testing by

the American Spinal Injury Association. After injury, dermatomes may expand or contract due to spinal cord plasticity.



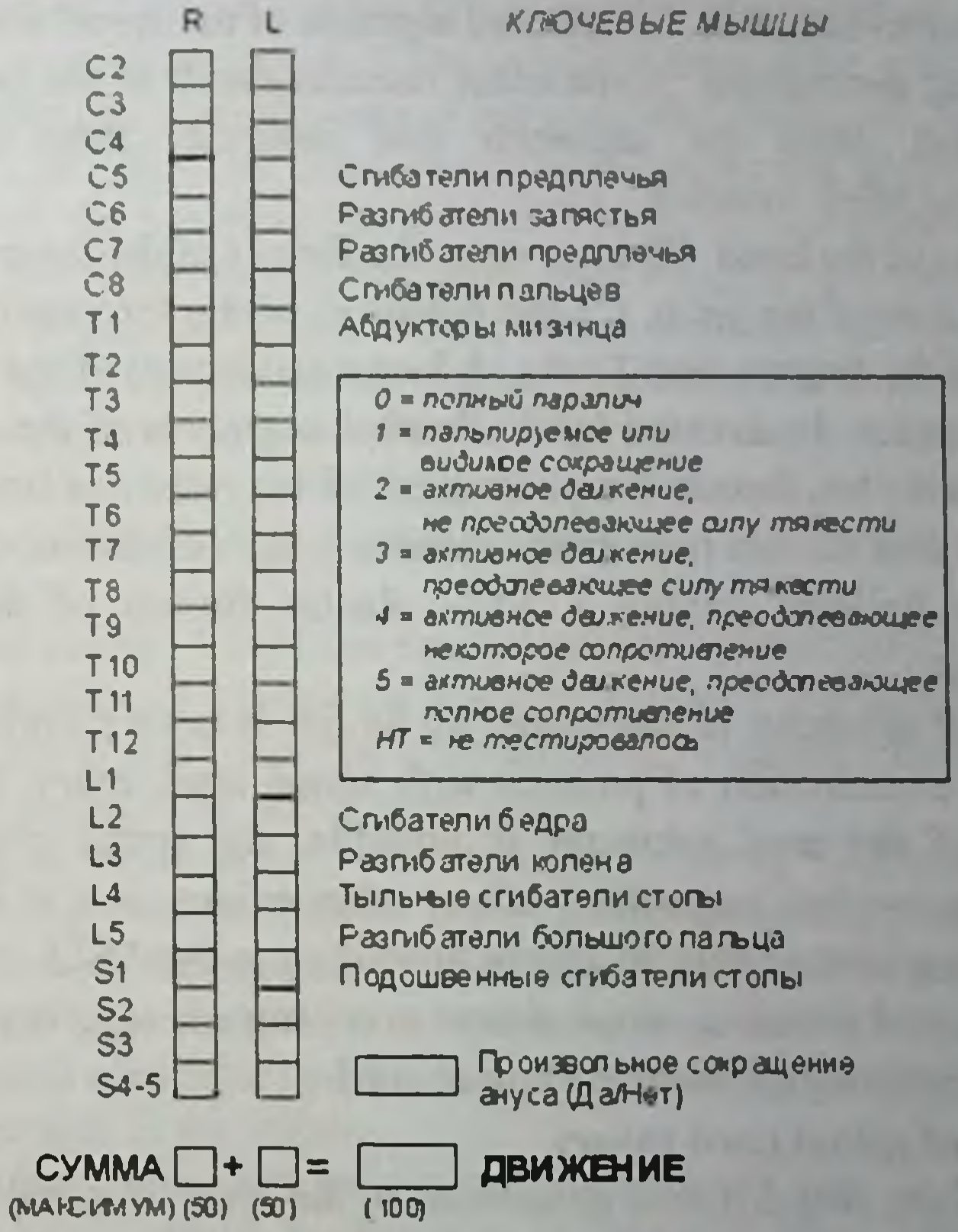
Rice. 5. Spine and segmental division of the spinal cord



Rice. 6. Zones of sensitive innervation.

C2-C4. C2-dermatome includes the skin of the occiput and upper neck. C3 - lower neck and collarbone, C4 - subclavian region.

C5-T1. These dermatomes are located on the arms. C5 - outer surface of the arm at and above the elbow. C6 - radial (from the side of the thumb) part of the forearm and hand. C7 - middle finger. C8 - lateral part of the hand. T1 - inner side of the forearm.



Rice. 7. Key muscle groups

T2-T12. Thoracic dermatomes are located in the axillary and thoracic region. T3-T12 cover chest and back to hips. The nipples are located in the middle of T4. T10 is located near the navel. T12 ends just above the thigh.

L1-L5. Dermatomeslocated in the area of the hip joints and groin are innervated by the L1 segment of the spinal cord. L2 and L3 cover the front of the thighs and knees. L4 and L5 - medial (inner) and lateral (outer) parts of the legs.

S1-S5. S1 is located on the heel and back of the leg. S2 - back of the thighs and popliteal fossa. S3 - medial buttocks and S4-S5 - perineum. S5 - anal area.

Ten muscle groups reflect the motor innervation of the neck and lumbosacral regions of the spinal cord. According to the ASIA system, the abdominal muscles (i.e. T2-11) are not tested, since at the thoracic level it is much easier to establish the affected segment of the spinal cord along the corresponding dermatome. Some other muscles (such as the popliteal) are also excluded, since the segments that innervate them are already represented by other muscles.

Muscles of the hand. C5 innervates the flexors of the forearm (biceps), C6 the extensors of the wrist, C7 the extensors of the forearm (triceps), C8 the flexors of the fingers, and T1 the abductor (adductor) of the little finger.

Leg muscles. Innervated by the lumbar segments of the spinal cord. L2 innervates the hip flexors (m. psoas), L3 - knee extensors (m. quadriceps), L4 - dorsal foot flexors (m. tibialis anterior), L5 - extensors of the thumb (m. extensor hallucis longus), S1 - plantar flexors of the foot (m. gastrocnemius).

The anal sphincter is innervated by S4-S5. It is very important in the neurological examination of patients with spinal cord injury. If voluntary contraction of the anal sphincter is possible, the spinal cord injury is considered incomplete, regardless of any other evidence. It is important to note that testing certain muscle groups according to the ASIA classification simplifies the real situation, since almost every muscle receives innervation from two or more segments of the spinal cord.

Levels of spinal cord injury

Doctors use two different definitions of the level of spinal cord injury. Based on the same neurological examination, neuropathologists and rehabilitation specialists can determine a different level of injury. Neuropathologists usually determine the level of damage by the first segment of the spinal cord in which dysfunction is detected. At the same time, physiotherapy and rehabilitation doctors determine the level of damage in the lowest segment with preserved function. Thus, if a patient has normal sensitivity at the C3 level and none with C4, the rehabilitator will say that the sensory level is C3, and the neuropathologist or neurosurgeon

will call the damage level C4. Most traumatologists and orthopedists determine the level of damage by the level of damage to the spine.

ASIA recommends determining the level of damage from the lowest segment with preserved function

Complete or incomplete damage

In the clinic, spinal cord injury is usually described as complete or incomplete. A complete injury is one in which there is no motor or sensory function below the site of injury. However, this definition is not always applicable. The following three examples illustrate the shortcomings and ambiguities of the traditional definition. The ASIA committee considered these issues when developing the spinal cord injury classification in 1992.

Zones of partial safety. Often, some segments of the spinal cord below the injury site retain a partial function, although in the other underlying segments, both motor and sensory function are absent. This is a fairly common occurrence. Many patients have areas of partial preservation. What kind of damage in this case - complete or incomplete, and at what level?

Lateral safety. A function may be partially preserved on one side, but absent on the other, or be there on a different level. For example, if a patient has no sensitivity with C4 on the right and with T1 on the left, is this damage complete or incomplete, and at what level?

Function restoration. The initially missing function below the damage site may then be restored. Does this mean that the spinal cord injury was complete and became incomplete? This is not a trivial matter, because if, for example, a clinical trial is being conducted in which only patients with complete spinal cord injury participate, it is necessary to stipulate the timing of the assessment of the status.

Most clinicians consider damage complete if there is a level of the spinal cord below which no function is detected. The Committee of the American Spinal Injury Association decided to take this criterion to its logical limit: the injury is considered complete if there is no motor and sensory function in the anal and perineal regions, which are innervated by the sacral (S4-S5) spinal cord.

The decision to make the absence of function at the S4-S5 level the criterion for complete damage not only removed the issue of zones of partial and lateral function preservation, but also solved the problem of restoration of function. As it turned out, only in a small number of patients in whom neurological functions at the level of S4-S5 were absent, they are restored

spontaneously. The ASIA classification separately indicates the motor and sensory levels on each side and the zones of partial preservation, as this simplifies the criterion for assessing the completeness of the damage.

Finally, the question itself: complete damage or incomplete, can be debatable. The absence of motor and sensory function below the injury site does not necessarily mean the absence of axons that cross the injury site. Animal studies and clinical data indicate that the function that is absent below the site of injury can be restored to one degree or another by restoring the blood supply to the spinal cord (in the case of arteriovenous malformation caused by ischemia), decompression (if there is chronic compression - compression of the spinal cord) or drug therapy, such as 4-aminopyridine. Assessing spinal cord injury as complete, one should not deprive a person of hope for recovery.

Severity classification of spinal cord injury

Physicians have long used the Stokes Clinical Neurological Deficit Rating Scale. Manville before World War II and widespread by Frankel in the 1970s. On this scale, patients were divided into five categories: no function (A), only sensory function (B), some sensory and motor function preserved (C), useful motor function (D), and normal (E).

ASIA Spinal Cord Injury Severity Scale

A=Complete: No motor or sensory function in sacral segments S4-S5.

B=Incomplete: Sensation preserved but no motor function in segments below the neurological level, including S4-S5.

C=Incomplete: Motor function below the neurological level is preserved, but more than half of the key muscles below the neurological level have a strength of less than 3 points.

D=Incomplete: Motor function below the neurological level is preserved, and at least half of the key muscles below the neurological level have a strength of 3 points or more.

E=Normal: motor and sensory functions are normal.

Clinical syndromes: central, Brown-Sequard, anterior pillars, conus medulla, cauda equina.

The ASIA Spinal Cord Injury Severity Scale is based on the Frankel scale, but differs from it in a number of important ways.

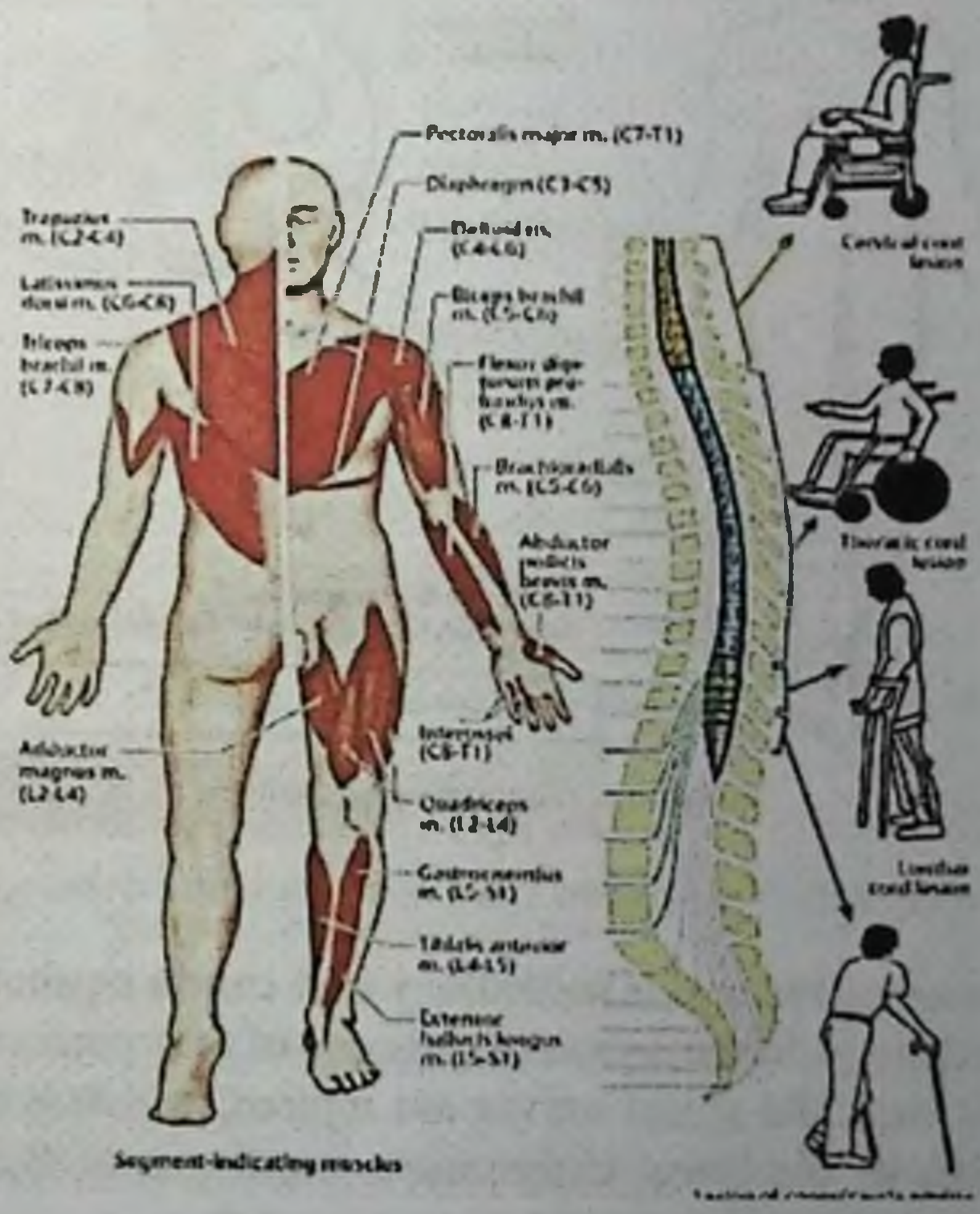
First, the absence of any function below the level of damage was replaced in category A with the absence of motor and sensory function in the sacral segments S4-S5. This definition is clear and unambiguous.

Category B ASIA is essentially identical to Frankel B, but adds a requirement for retained sensory function in S4-S5. It should be noted that

the defining moment in categories A and B on the ASIA scale is the preservation of motor and sensory function in S4-S5.

ASIA also added a quantitative measure for categories C and D. The Frankel scale required clinicians to rate the functional fitness of the lower extremities. This not only introduced a subjective element into the classification, but also ignored the assessment of hand function in patients with cervical spinal cord injury. To circumvent this problem, ASIA specifies that category C includes patients with more than half of the key (recommended for testing) muscles retaining strength less than 3 points. Otherwise, the patient is assigned to category D.

Category E is interesting in that it includes patients with spinal cord injury without any neurological deficit, at least detectable on neurological examination. The ASIA Motor and Sensory Scale does not take into account the presence of spasticity, pain, muscle weakness, and some forms of dysesthesia, which can result from spinal cord injury. Such patients should be assigned to category E.



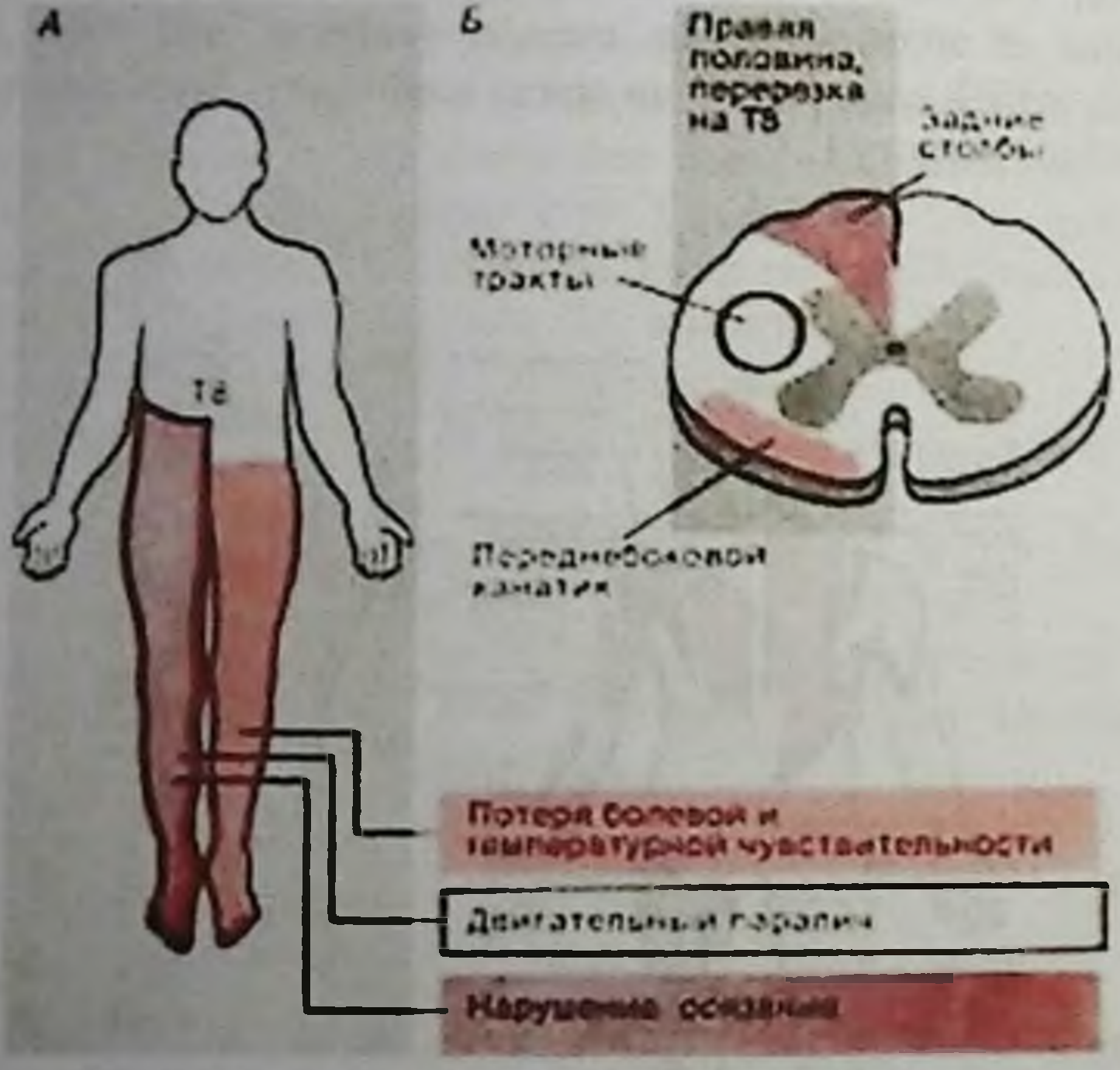
Rice. 8. Topography of spinal cord injuries

ASIA has also classified incomplete spinal cord injury into five types.

Central syndrome (with greater damage to the gray matter of the spinal cord : hemorrhages, necrosis): unequal severity of motor disorders in the upper and lower extremities, a varied degree of sensory impairment (Fig. 8.).

Sequard syndrome - damage to one half of the spinal cord: impaired motor functions and proprioceptive sensitivity on the side of the lesion and loss of pain and temperature sensitivity on the other side (Fig. 9.).

Syndrome of the anterior columns: impaired motor functions of both pain and temperature sensitivity while maintaining proprioceptive sensitivity (damage affects the lateral corticospinal and corticothalamic tracts, the posterior columns remain intact).



Rice. 9. Brown-Sequard syndrome (schematic drawing)

Syndromes of the conus medullary and cauda equina are observed when there is damage in the region of the cone of the spinal cord and cauda equina. In this case, the spinal nerves are injured, which is manifested by flaccid paralysis of the lower extremities, anesthesia of the sciatic zone, impaired bowel and bladder functions.

There is no unity in the terminology associated with the level and severity of spinal cord injury. The American Spinal Injury Association has attempted to standardize the terms used to describe spinal cord injury. The new ASIA classification is now accepted by almost all organizations dealing with this problem worldwide.

Pain syndromes in injuries of the spine and spinal cord. Most often, with injuries of the spinal cord and its roots, radicular pains are observed (shooting, twitching, resembling the sensation of passing an electric current, etc.). Sometimes radicular pains have a causal coloring.

In the acute period of trauma to the spine and spinal cord, radicular pain can be due to:

1) compression of the roots due to fractures of the spine with displacement;

2) direct compression of the roots by bone fragments;

3) metallic foreign bodies;

4) acute hernial protrusion of the intervertebral discs;

5) subarachnoid hemorrhages.

Radicular pain can be intolerable, excruciating. With damage to the cauda equina, these pains may serve as an indication for emergency surgery. The appearance of radicular pain in the late period of spinal cord injury may indicate the development of late complications (formation of callus, traumatic spondylosis).

Disorders of the functions of the pelvic organs. Damage to the spine and spinal cord entail disorders of urination, defecation and sexual function, which is a very aggravating condition of the patient.

Depending on the level of damage to the spinal cord, two types of urination disorders are distinguished: the conductive type, when the main lesion is located above the spinal centers that regulate urination, the type of disorder observed when the most spinal centers of urination are affected. When the spinal cord is affected, sphincter paralysis is observed and urine is usually excreted as it accumulates in the bladder without the urge to urinate. If the cone of the spinal cord (parasympathetic centers of urination) is affected, then flaccid paralysis occurs, while the sphincter is usually spastically contracted, and only with a significant accumulation of urine in the bladder does the sphincter begin to pass urine drop by drop - paradoxical ischuria develops.

In order to determine the reversibility of functional changes in the damaged spinal cord and cauda equina, along with other methods of clinical examination, the study of cystic reflex cystometry can also be used. The

study of the cystic reflex in patients with urination disorders showed that the remaining cystic reflex may be the earliest symptom, allowing to exclude a transverse rupture of the spinal cord and cauda equina.

It is important to note that in the late period of spinal cord injury, the recovery of the cystic reflex occurs even with an anatomical interruption of the spinal cord, which may be due to the adaptation and restoration of the regulatory influence of the cerebral cortex along the roundabout pathways of innervation, in particular, through the borderline sympathetic trunks. Already during the first 5-7 days, and sometimes the first hours after injury, neurodystrophic and inflammatory changes can rapidly develop in the wall of the bladder. Violation of the function of the urinary and urinary systems with infection in the future can lead to the development of urosepsis, which is a severe, often fatal complication.

The spinal centers that regulate the function of the rectal sphincter are located at the level of III - V and I - III segments of the lumbar spinal cord, therefore, damage to the spinal cord above this level leads to spastic paralysis of the rectal sphincter, causing persistent constipation. With the defeat of the same centers, there is a flaccid paralysis of the sphincter, fecal incontinence and involuntary discharge of flatus.

The reflex centers of erection are located at the level of the IV - V lumbar segment. Damage to the spinal cord above the location of these centers leads to involuntary hyperemia of the cavernous bodies of the penis. Venous edema is difficult due to spasm of the muscles of the perineum. In such patients, the penis may be in a state of persistent erection-priapism. Damage to the spinal cord at the level of the location of the erection centers or below them leads to its disappearance.

Violations of the functions of the cardiovascular system. Damage to the spinal cord and its roots can lead to significant changes in cardiovascular activity. A.L. Polenov and I.S. Babchin (1954) observed complications of cardiac activity during chordotomy at the level of the upper thoracic segments of the spinal cord, which are directly related to the innervation of the heart. Cardiac disorders in spinal cord injury were also noted by I.I. Grashenkov (1964) and I.Ya. Razdolsky (1947, 1952). An important circumstance is the presence in all patients of widespread changes in vascular reactivity, both below and above the level of spinal cord injury, regardless of its nature.

Violation of the functions of the respiratory system. Spinal cord injury can be complicated by pneumonia. Most often, pneumonia develops in patients with injuries of the cervical and thoracic spine and spinal cord.

A prerequisite for the development of pneumonia in the early period of injury are disorders of external respiration of central origin due to the involvement in the pathological process of the medulla oblongata with its respiratory center, segmental centers of the thoracic nerve, segmental centers innervating other respiratory muscle groups, in particular intercostal muscles. The above data on the violation of the activity of internal organs make it possible to emphasize that spinal cord injury is a lesion of the whole organism that changes the functions of its various systems.

Trophoparalytic complications

Pressure ulcers are the most common complication of spinal cord injury (Fig. 10). According to various publications, the frequency of their development reaches 53-90%. The wound surface that does not heal for a long time is the entrance gate of infection and ultimately leads to the development of sepsis, which in the intermediate and late periods of traumatic spinal cord disease is the cause of death of 20% of the victims. The presence of extensive bedsores, covered with a scab, is often the cause of prolonged fever, the genesis of which becomes apparent only after necrectomy.

Rice. 10. Degrees of bedsores

But in other cases, the presence of bedsores is a source of chronic intoxication, leading to the development of persistent anemia, hypoproteinemia, amyloidosis of internal organs. These circumstances cause a forced postponement of radical operations on the spine and spinal cord, which significantly reduces their effectiveness. Bedsores, of course, greatly complicate the implementation of rehabilitation measures, limit their range, shift in time, which again affects the results.

The pathogenesis of the formation of bedsores and the mechanisms of their healing are still not fully elucidated, although, according to clinical and experimental data, the healing time and the nature of the scars that form in patients with spinal cord injury do not differ significantly from those in people with other severe somatic diseases. The timing of formation, prevalence, depth of bedsores largely depend on the level and nature of spinal cord injury, however, measures for their prevention play a huge, and sometimes decisive role in their development. The basis of prevention is the careful implementation of care measures from the first minutes of the meeting of medical staff with such victims. If the victim was delivered on a shield, then you should immediately transfer him to a mattress with a neatly straightened and stretched sheet. The skin of the undressed patient must be wiped dry and treated with camphor alcohol, the paralyzed limbs should be placed in a functionally advantageous position, and stops in the form of pads with a soft coating should be placed under the hanging paralyzed feet. It should be remembered that the most common places for the formation of bedsores are bony protrusions in the area of the shoulder blades, hip joints, heads of the fibula, ankles, and heels. Therefore, special attention should be paid to their condition. Under these places it is necessary to lay soft small linings, foam rubber pillows lined with clean boiled cotton cloth, cotton-gauze "bagels". When changing the position of the body of the victim, which must be done every 3 hours, these places should be vigorously rubbed until the natural color of the skin is restored and wrinkles are eliminated.

When maceration appears on the skin, these areas should be treated with an alcohol solution of brilliant green or a tanning solution of potassium permanganate.

Maintaining the optimal skin temperature is of great importance, especially in the cold season. When warming the victim with heating pads, it is imperative to remember the loss of skin sensitivity in the most seriously injured patients and the prevention of burns. Modern multi-section anti - decubitus mattresses filled with water or air are an effective means of preventing bedsores. Many of them have devices for maintaining a constant

temperature. A periodic change in pressure in their sections leads to an equally periodic unloading of individual parts of the body, a decrease in pressure on the skin, which reduces the risk of pressure sores. Of great importance in the prevention of bedsores are the timely correction of indicators of peripheral blood, proteins, good nutrition and the use of anabolic hormones.

It should be emphasized that measures to prevent pressure sores, although they are of particular importance in the acute and early periods of spinal cord injury, must be carried out throughout the patient's life. Forming bedsores should be classified according to V.P. Bilic (1971):

1) superficial decubitus - with damage to the surface layers of the skin;

2) deep bedsore - with skin lesions in full thickness;

3) bedsores, accompanied by bursitis, - with damage to the articular bag and opening the joint cavity;

4) decubitus-osteomyelitis accompanied by the development of osteomyelitis of the underlying bone.

Conservative treatment of bedsores is extremely time-consuming and, as a rule, stretches for many months and even years. It should be noted that the presence of bedsores with damage to articular formations, bones excludes the possibility of their healing in a conservative way. It can be recommended only in the presence of superficial bedsores and consists in the local use of antiseptic solutions, UV irradiation of the edges of the wound, and as it is cleansed of necrotic masses, ointment dressings are used to promote epithelialization of the wounded surface. As a result of conservative treatment, successful healing of bedsores within 3-6 months. can be achieved in 38% of patients.

The methods of skin plasty used in the treatment of long-term non-healing, recurrent bedsores, bedsores with callused edges, osteomyelitis of the underlying bone, chronic external fistulas can be used for small wound surfaces with the prospect of their replacement with local tissues due to the use of figured incisions, in particular -shaped ones. Of essential importance is the final stage of the operation with the imposition of a blind suture on the wound, with active or tidal drainage.

The limited possibilities of mobilizing local tissues do not always allow achieving the desired effect. The use of split skin flaps leads to a relatively complete healing of bedsores in 43-78% of cases after 2-2.5 months. It must be emphasized that such operations require a sufficiently long preoperative preparation aimed at cleansing the wound surface from purulent-necrotic masses, including the performance of repeated

necrectomy and the formation of a relatively complete granulating surface. In patients with decubitus ulcers affecting the articular formations, accompanied by osteomyelitis of the underlying bone and the formation of a chronic fistula in the area of the decubitus, there is a need to expand the scope of the operation. In these cases, after excision of the edges and bottom of the wound, the altered areas of the bone must be resected with nippers until bleeding occurs from the unchanged spongy substance. In the future, the wound is drained with a tidal system for 5-7 days and sutured tightly. Failures of surgical treatment in such cases may be due to the forced position of the limbs with a pronounced spastic syndrome or non-radical treatment of the bone part of the wound. Such operations bring the desired result in 73-78% of patients.

The optimal method of operative closure of bedsores today is non-free plasty with rotational and islet dermal-fat and musculoskeletal flaps. Indications for it are large bedsores reaching the periosteum of the sacrum or penetrating into the cavity of the hip joint, including multiple ones. A bedsore wound is prepared for 5-7 days, changing dressings with active sorbents twice a day. At the same time, if necessary, erythrocyte mass, plasma, protein preparations from blood plasma are transfused. The operation consists of three main steps:

excision of a bedsore, cutting out a complex skin flap, moving it and suturing it to the edges of the wounded defect with suturing or plasty of the donor wound. When cutting out the flap, it is necessary to take into account the contractility of the skin and form a flap 1-2 cm larger than the size of the bedsore, which will avoid eruption of the sutures. It is also important to preserve the main sources of blood supply to the formed flap, which for the most part are of a perforating nature. This technique allows to avoid necrosis of the flaps and significantly increase the effectiveness of surgical treatment. In 94.5% of the victims operated on by this technique, full-fledged skin is restored much faster than with traditional methods of treatment, this method is the most promising and complete, which is associated with the possibility of fairly rapid healing of bedsores in more cases than with traditional methods. medical activities. In addition, this method is, in fact, the only one that allows you to close large bedsores. It can also be used for recurrent bedsores.

And, finally, this technique, due to its surgical radicalism, does not require any lengthy preparation associated with wound sanitation, unlike other plastic surgery methods.

Urological complications

Complications from the urinary system, until recently, invariably accompanied by spinal cord injuries. Their development, subsequent generalization of the inflammatory process with an outcome in urosepsis are the cause of death of 30-50% of the victims. Increasingly successful prevention and treatment of these complications has led to the fact that 76% of patients now survive the 25-year period after injury, and in 51% of them life expectancy reaches that of healthy people.

The nature of urological complications is largely determined by the level and nature of spinal cord injury, although acute urinary retention usually develops in the acute and early periods of injury. With low injuries of the spinal cord, when the sacral segments and roots of the cauda equina suffer, i.e. when it comes to damage to the peripheral motor neuron, the mechanism of urinary retention is explained by the preservation of residual muscle tone of the detrusor and sphincter of the bladder. As it disappears, a typical picture of true urinary incontinence is formed. In other cases, urinary retention becomes persistent, changing with less traumatic injuries of the spinal cord by an imperative urge to urinate. Urinary retention is predictively the most unfavorable type of urination disorders, since it causes a constant threat of the development of inflammatory complications and stone formation and requires the adoption of special measures for the evacuation of urine by various methods.

Urinary retention, overstretching of the walls of the bladder lead to ruptures of its mucous membrane and the development of ulcerative hemorrhagic cystitis; the stay of urine in a crowded bladder, the presence of significant portions of residual urine (over 150-200 ml) cause its infection; the reflex of infected urine leads to the defeat of the pyelocaliceal system and the renal parenchyma. The development of inflammatory complications is especially facilitated by the formation of an alkaline reaction of urine, which is noted in the vast majority of victims with urinary retention. The choice of optimal methods for emptying the bladder in this condition is still under discussion. In historical terms, it is necessary to name manual squeezing of urine, drainage with an indwelling catheter, tidal drainage according to Monro, a high section of the bladder, its periodic catheterization.

Manual squeezing of urine has retained its significance only in patients in the residual and late periods of trauma. Its main disadvantages are the inability to fully empty the bladder and the preservation of significant

volumes of residual urine. In this regard, it becomes necessary to catheterize the bladder at least once a day for its complete emptying and washing with an antiseptic solution. The removal of urine by continuous catheterization of the bladder is one of the most common methods of emptying the bladder. At the same time, it is associated with the threat of developing serious complications from the urethra and scrotum due to the long stay of a foreign body. The development of persistent urethritis, pressure sores of the urethra, orchiepididymitis is by no means uncommon and forces one to resort to the imposition of a suprapubic fistula. Difficulties with external fixation of the catheter, which greatly complicates the care of such patients, cutting urine outside of it with a too small diameter, necessitates the use of a Foley catheter, since it is equipped with a special device for fixation.

Regular (1 time in 3 days) change of the catheter, instillation of antiseptic solutions (furacilin, collargol, 0.25% solution of silver nitrate, 5% solution of chlorine dioxidine), removal of the catheter at night, the use of disposable catheters made of thermoplastic materials to a certain extent reduce the threat development of inflammatory complications.

A high section of the bladder, performed with the development of severe inflammatory complications, ends with its drainage with a catheter, preferably having a special device in the form of a rubber thickening for its internal fixation, a Petzer catheter. The operation can be performed both in the traditional, open way, and by the method of thoracic puncture. Regular change of the catheter after the formation of a suprapubic fistula is mandatory to prevent the formation of calculi. Both permanent catheterization and the presence of a suprapubic fistula can be used for tidal drainage of the bladder with the Monro system. The system is installed in such a way that the antiseptic solution is dripped (episodic inkjet) into the cavity of the bladder, mixed with urine and immediately evacuated from it, which can significantly reduce the risk of developing inflammatory complications or stop them.

Intermittent catheterization of the bladder at 8-hour intervals is currently considered the optimal method. With pedantic observance of the rules of asepsis, this allows you to relatively quickly form the mode of "spinal automatism", i.e. periodic emptying of the bladder not controlled by the patient as it fills due to the preservation of the function of the sacral urination center. In most cases, patients catch the upcoming release of urine for a number of precursors in the form of sweating, feelings of heat of various localization, tachycardia.

In addition to measures for the evacuation of urine, it is mandatory to correct its reaction (transfer to slightly acidic) by prescribing ammonium sulfate, ascorbic acid. Mandatory courses of antiseptics in case of fever, massive doses of antibiotics (preferably two), detoxification therapy with an increase in inflammatory complications. With the threat of urosepsis development or its occurrence, treatment must be carried out in full, using the principles of treatment of septic conditions.

Diagnosis of spinal cord injuries

The system of a comprehensive examination of a patient with damage to the spine, spinal cord and its roots includes: 1. Assessment of the state of the spine, using examination, palpation, percussion, as well as x-ray studies; 2. Neurological studies (assessment of the general symptoms of motor, sensory and reflex disorders);

3. Study of the patency of the subarachnoid space of the spinal cord by means of a lumbar puncture with subsequent liquorodynamic tests, if necessary, pneumomyography, scanning, examination of the composition of the cerebrospinal fluid;

4. Electrophysiological study;

5. Examination of sweating with the use of Minor's iodine-starch test;

6. Studies of the state of the organs of the chest and abdominal cavity of the pelvis;

7. Computed magnetic resonance imaging.

It must be remembered that all patients with injuries of the spine and spinal cord should be examined in the supine position or on the side. Along with this, it should still be emphasized that the results of observations of various clinical manifestations of spinal cord injury play an important role in resolving these issues.

Treatment of spinal cord injuries

When specifying the indications for surgical intervention, the general condition of patients with injuries of the spine and spinal cord should be taken into account, which may be due to the severity of spinal cord injury, concomitant damage to the brain, in particular its stem sections, and combined damage to the organs of the chest, abdominal cavities and small pelvis.

Associated injuries of the brain, in particular the medulla oblongata, are most common in trauma to the cervical spine and spinal cord. The pathological process of the medulla oblongata can be aggravated by circulatory disorders, its ascending edema and swelling. At the same time,

respiratory disorders come to the fore. Bulbar symptoms, in particular swallowing disorders, bradycardia, join respiratory disorders.

In cases where respiratory disorders in combination with other bulbar symptoms occur immediately after a closed injury or a gunshot wound of the cervical spine, the question of indications for surgical intervention in such patients should be decided with great caution. In the absence of the effect of conservative treatment, increasing bulbar disorders are an indication for urgent laminectomy.

Damage to the spine and spinal cord can be complicated by traumatic shock. At the same time, patients are lethargic, apathetic. Blood pressure 70/40 or 50/40 mm. rt. Art. In rare cases, more often with injuries of the cervical spinal cord, hypertension may occur. Recognition of traumatic shock complicating trauma to the spine and spinal cord is very important because patients must be taken out of shock before surgery.

Indications for surgical intervention are:

1. An increase in neurological symptoms, spinal cord lesions in the process of monitoring the patient in the first hours and days after the injury. Hemorrhages, secondary displacements of bone fragments, spinal cord edema, aggravation of vascular disorders can be the reasons for the development of secondary or aggravation of primary symptoms.

2. Acute development of the syndrome of the anterior spinal artery, regardless of the presence or absence of impaired patency of the subarachnoid spaces of the spinal cord. Syndrome of the anterior spinal artery develops with posterior displacement of the vertebral body and hernial protrusion of the intervertebral disc.

3. Violation of the patency of the subarachnoid space of the spinal cord with a picture of partial and complete transverse damage to the spinal cord. In addition, with early laminectomy, resolving and organizational processes are accelerated, secondary traumatic necrosis, as a rule, is less pronounced, and edema spreads to a lesser extent.

4. Irritation and compression of the roots of the spinal cord caused by bone fragments and prolapse of the intervertebral disc.

Contraindications to surgical intervention are:

1. Traumatic shock.

2. Severe combined damage to the spine and spinal cord, internal organs, brain and limbs. Under these conditions, spinal surgery should be performed after appropriate treatment of other organs and body systems.

3. Various kinds of intercurrent diseases (sepsis, urosepsis, purulent complications from the urinary tract).

4. Severe damage to the upper cervical segments of the spinal cord and medulla oblongata, proceeding with lightning-fast development of the bulbar symptom complex.

Surgical intervention for injuries of the spine and spinal cord is undertaken for:

1. Restoration of normal relationships between the spine, spinal cord, membranes and roots;

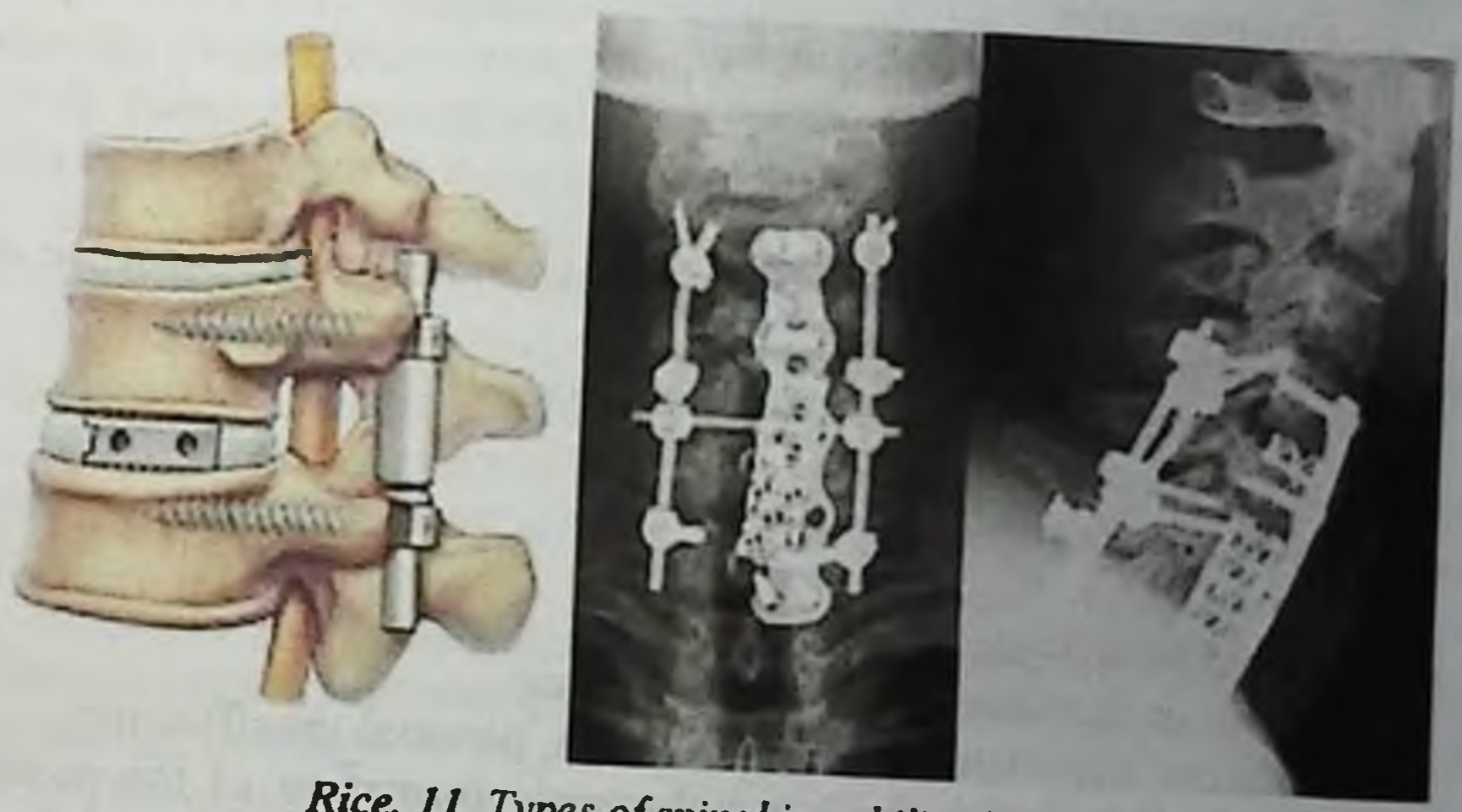
2. Removal of bone fragments that have penetrated into the lumen of the spinal canal, fragments of ligaments, bloody areas;

3. Restoration of CSF outflow through the subarachnoid space of the spinal cord;

4. Normalization of blood circulation in the spinal cord, or reduction of vascular disorders;

5. Reducing the irritation of the conductors of the spinal cord and its decompression;

6. Stabilization and, according to indications, fixation of the spine (Fig. 11.).



Rice. 11. Types of spinal instability fixation (transpedicular fixation, anterior and posterior fusion)

TEST QUESTIONS

1. Decompressive laminectomy is called:

a) The dura mater is not sutured at the end of the operation.

b) the dura mater and back muscles are not sutured at the end of the operation

c) At the end of the operation, only the back muscles are not sutured.

d) At the end of the operation, the resected bone fragments are replaced.

e) the wound is tightly closed.

2. There are the following types of myelography:

a) negative positive

b) positive ascent

c) pneumomyelography

d) isotope myelography

e) all answers

3. Radiography of the spine after subarachnoid injection of a liquid contrast agent or a gaseous contrast agent is called:

a) Electrography

b) radionuclide encephalography

c) exomyelography

d) contrast myelography

e) spondylography

4. A positive Stuckey test (lower block) indicates the presence of a volumetric formation:

a) in the cervical region of the spinal cord

b) in the thoracic spine

c) in the lumbar spine

d) in the spine

e) at the base of the brain

5. Contraindications for lumbar puncture:

a) Arterial hypertension, body diseases, parental insufficiency.

b) congestion in the fundus, volumetric formation of the posterior cranial fossa, coma.

c) secondary meningitis, meningoencephalitis of various etiologies.

d) epileptic seizures, cachexia.

e) postoperative period (condition after removal of volumetric formations of the brain and spinal cord).

6. When treating a severe neurosurgical patient, first of all it is necessary:

a) Wipe the body with gauze, warm soapy water and a dry towel.

b) Drain with a catheter, controlling urinary retention.
c) Remove cleansing scrubs regularly.
d) keep the bed clean.
e) All of the above are correct.

7. Lumbar puncture is performed in the following cases:
a) tick
b) sitting and lying on the stomach
c) lying on the stomach
d) sit and lie next to him
e) sit on your back

8. The most important complications of spinal cord injury:
a) spinal deformity, purulent-inflammatory complications (paravertebral, osteomyelitis, epiduritis).
b) violation of the motor, sensory and trophic functions of the pelvic organs
c) muscle atrophy, shortening of the limbs, complications in the heart, brain and lungs
d) mental disorder, spinal cysts after injury, impaired muscle tone.
e) Metabolic diseases, instability of the spine, deformity and narrowing of the spinal canal, purulent myelitis, osteochondrosis.

9. Adequate transportation of the victim with a dislocation of the uterus and a fracture of the spine can be provided:
a) Lay the patient on his side on a hard mattress, prescribe morphine and injections
b) Transport the patient, placing him on the knee of the attendant in the back seat of the car, but keeping his left hand under the neck.
c) Put a bandage on the neck, place the victim in a tight tube on the upper or abdominal cavity, to prevent respiratory and cardiovascular diseases.
e) Before transportation, antipyretic, hormonal drugs are prescribed, a lumbar puncture is performed to relieve swelling of the spine, transportation is carried out by road.
f) The victim must be taken to the nearest hospital by any means of transport and qualified medical assistance must be provided there.

10. A positive Stuckey test indicates the presence of volumetric data:
a) In the cervical region of the spinal cord.
b) in the thoracic spine.
c) in the lumbar spine.
d) in the sacral spine.
e) in the basal regions of the brain.

11. A positive Queckenstedt test indicates the presence of volumetric

data:

a) In the cervical region of the spinal cord.
b) in the thoracic spine.
c) in the lumbar spine.
d) in the sacral spine.
e) in the basal regions of the brain.

12. A positive Poussep test indicates the presence of volumetric data:

a) In the cervical region of the spinal cord.
b) in the thoracic spine.
c) in the lumbar spine.
d) in the sacral spine.
e) in the basal regions of the brain.

13. Choose the right treatment for a patient with a mild spinal injury:

a) Detoxification, hormonal and antibacterial therapy
b) symptomatic and osmotic therapy. Hemostatic, desensitizing drugs
c) hyperbaric oxygen therapy, physiotherapy, anticonvulsant therapy, vitamin therapy
d) physical cooling, dehydration, corticosteroids, antibiotics
e) Biostimulants, vitamin therapy, hemostatic therapy, blood transfusions and blood substitutes.

14. A mild spinal injury differs from a concussion in the following symptoms.

a) prolonged loss of consciousness, recurrent vomiting, subarachnoid hemorrhage
b) the severity of hemispheric symptoms, limb cramps and hyperkinesis
c) the possibility of spinal and subarachnoid hemorrhage
d) retrograde and atherograde amnesia, the presence and increase of focal symptoms
e) They cannot be distinguished without computed tomography

15. Specify additional methods necessary for examination of a victim with spinal cord injury:

a) Craniography, lumbar puncture, measurement of CSF pressure, Exo-EG, CT
b) lumbar puncture, suboccipital puncture, AG, CT, pneumocisternography, ultrasound
c) Pneumoencephalography, MRI, radioisotope diagnostics, lumbar puncture
d) myelography, CT, Echo-ES, craniography, AG, thermal imaging
e) spondylography, lumbar puncture, MRI, CT, lycodynamic tests and myelography

16. Tactics to increase wound bleeding:
a) The patient is prescribed antihemorrhagic and hemostatic agents
b) the patient is prescribed angioprotectors
c) the surgical wound is tightly closed
d) open the surgical wound and leave the graduates
e) revision of the surgical field, hematoma, hemostasis evacuation
17. Dry hematomyelia:
a) bleeding into the spinal canal
b) craniocerebral hemorrhage
c) spinal bleeding
d) bleeding into the subarachnoid space
e) cerebral hemorrhage
18. Select the appropriate additional methods for examining a patient with midbrain contusion:
a) craniography, exo-ES, fundus examination, lumbar puncture, determination of intracranial pressure
b) lumbar puncture, doppler ultrasound, craniography
c) Radioisotope diagnostics, thermal imaging diagnostics, computer diagnostics (Glasgow coma scale), lumbar puncture
d) Lumbar puncture, CT, MRI, spondylography, CSF examination, myelography
e) All answers are correct.
19. Which of the following is a lycodynamic test:
a) Arendt's test, suboccipital puncture
b) Pneumosancephalography, pneumoventriculography
c) Examples of Kveckenstedt, Stukey and Pussep
d) positive myelography, pneumomyelography
e) endolumbar inflation of oxygen
20. What is the purpose of hydrodynamic testing?
a) Determine the pressure in the cerebrospinal fluid
b) for medicinal purposes
c) for the treatment of inflammatory processes in the brain and spinal cord
d) determine the patency of the spinal subarachnoid space
e) detect the presence of a brain tumor
21. Determine the tactics of treatment of spinal cord injury with spinal cord compression:
a) only conservative
b) Strong conservative treatment in case of failure of lumbar puncture
c) emergency surgery
d) Conservative treatment should be combined with the appointment

of natural healing solutions of oriental medicine

e) Medical assistance to such a seriously ill patient does not give a positive result.

22. After the subarachnoid injection of thick and gaseous contrast agents, an X-ray of the spine is performed;

a) Electromyography.
b) spondylography.
c) exomyelography.
d) contrast myelography
e) electroencephalography

23. The length of the spine (cm) in preschool children.

a) 30-35 cm.
b) 35-40 cm.
c) 40-45 cm.
d) 45-50 cm.
e) 50-55 cm.

24. Lycodynamic tests are carried out to determine:

a) having a brain tumor
b) blockade of the spinal subarachnoid space
c) inflammation of the spine
d) the presence of bleeding into the subarachnoid space
e) fluid pressure

25. Under the skull, two vertebral arteries join and form:

a) middle cerebral artery
b) main artery
c) anterior artery
d) spinal artery
e) circle of Willis

26. When caring for a seriously ill neurosurgical patient, it is necessary first of all:

a) Wipe the body with a piece of gauze dipped in warm soapy water and a damp towel
b) Isolation through the catheter, observing urinary retention
c) Remove cleansing scrubs regularly
d) monitor the frequency of beds
e) All of the above are correct.

27. If complications occur during a lumbar puncture, it is necessary:

a) Remove the patient immediately, hormonal therapy
b) lift only the apex of the heart, cardiac glycosides
c) elevation of the tip of the foot, dehydration
d) artificial respiration and chest compressions

e) call the resuscitator and the head of the clinic for help

28. In the absence of aggravating factors in a victim with an average degree of spinal cord injury. one should wait for the correct choice of treatment course:

a) bad result
b) 1 disability group
c) 2nd disability group
d) 3rd disability group
e) full (absolute) recovery

29. Organization of medical care for patients with severe injuries of the brain and spinal cord as a result of severe injuries and accidents

a) Urgent transportation of victims by transport to large cities
b) When approaching hospitals at the site of a natural disaster, transport them after emergency operations and manipulations
c) Organize help for all, paying special attention to those who ask for help
d) In such cases, it is impossible to organize effective medical care
e) All of the above answers are correct because they complement each other

30. In newborns, the lower border of the spine is at the level of the following lumbar vertebrae:

first
b) second
c) Third
d) fourth
e) Fifth

31. Weakness in one arm or leg could be related to any of the following:

a) half rupture of the cervical spine
b) herniated disc
c) acute shoulder plexitis
g) peripheral nerve injury
e) polyneuropathy

32. In the acute period, with full movement of the spine at the S5 level, hyporeflexia and hypotension occur against the background of hypodynamia, in which hyperreflexia and spasticity usually change:

a) 2-4 months
b) 1-2 months
c) 3 days to 3 weeks
d) 1 to 3 hours
e) 5 to 35 minutes

33. A 23-year-old woman after a biopsy of the lymph node of the neck reported instability of the shoulder position, and a neurological examination revealed pterygoid retention of the scapula during surgery. Apparently, during the operation will be damaged:

a) deltoid mice
b) long thoracic nerve
c) anterior dental muscles
d) suprascapular nerve
e) axillary nerve

34. Fractures of the lumbar vertebrae usually occur when:

a) back bend
b) Redistribution
c) turn back
d) spondylolisthesis
e) subluxation

35. Spina bifida occurs in the following cases:

a) invisibility of the anterior elements of the spine
b) mesentery of the dorsal elements of the spine
c) list of ventral elements of the spine
d) lysis of the lateral elements of the spine
e) non-ionization of the lateral elements of the spine

36. Atlantotoxic subluxation can develop as a complication of a long-term process:

a) myotrophic lateral sclerosis
b) syringomyelia
c) rheumatoid arthritis
d) olivopentocerebellar degeneration
e) neurofibromatosis

37. In Brown-Sequard syndrome, when the spinal cord is cut in half, spastic paresis develops in the muscles innervated by nerves extending from the spinal roots:

a) At the level of damage on both sides
b) on the damaged side
c) on the opposite side of the lesion at the level of injury
d) below the level of damage
e) on the opposite side of the injury below the level of the injury

38. Compression of the S8 spinal cord is accompanied by nerve injury:

a) elbow
b) proteins
c) medium
d) radiation

e) long chest

39. When lifting the right leg, when the patient is lying, there is pain in the back, which easily radiates to the raised leg. Estimated:

a) torn quadriceps muscle
b) aseptic necrosis of the femoral head
c) psoriatic arthritis of the spine
d) inflammation in the pelvic cavity
e) hernia of the lumbar spine

40. When a patient complains of tingling in the hands and feet, a sensitivity disorder of the "glove" and "sock" type usually develops in the following diseases:

a) peripheral nerves
b) brachial plexus
c) spine
d) brain stem
e) optical tube

41. When a young man who broke his humerus in a car accident tried to bend his arm at the elbow, he felt weakness and paresthesia on the palmar surface of the beam. Apparently, he was injured in the accident:

a) suprascapular nerve
b) long thoracic nerve
c) mushakokutansky nerve
d) radial nerve
e) median nerve

42. What are the symptoms of a spinal cord injury?

a) muscle hypotension, fibrillation, malnutrition, hyporeflexia
b) fibrillation, muscle hypertension
c) muscle hypertrophy, hyperreflexia, pathological reflexes
d) fibrillar torsion, muscular hypotension
e) muscle hypotension, malnutrition, anesthesia

43. What movement disorders are observed in total damage to the transverse spine at the level of the upper cervical segments?

a) peripheral paresis in the arms, central in the legs
b) central tetraparesis
c) central paresis of the hands
d) central paresis in the legs
e) central hemiparesis

44. What movement disorders are observed in total spinal injury at the level of the cervical enlargement:

a) peripheral paresis in the arms, central in the legs
b) central tetraparesis

c) paresis in the hand of the central character
d) paresis in the arm of a peripheral nature
e) paresis in the legs of a peripheral nature

45. What movement disorders are observed in total damage to the transverse spine at the level of the thoracic segments?

a) paresis of the legs of a central nature
b) paresis in the legs of a peripheral nature
c) paresis in the peripheral arms and legs of a central nature
d) paralysis of the pectoral muscles
e) paralysis of the phrenic nerve

46. What movement disorders are observed in total spinal injury at the level of the lumbar expansion?

a) central paresis of the lower extremities
b) paralysis of the pelvic muscles
c) peripheral paresis in the legs
d) paralysis of the muscles of the perineum
e) paralysis of a peripheral nature in the legs

47. A patient with lower paraparesis has a high tone, increased tendon reflexes, pathological reflexes, and paranesthesia. Where is the disease located?

a) spine
b) lumbar spine
c) sacral spine
d) thickening of the cervical spine
e) anterior central gyrus

48. Tetraparesis in the hands of patients is characterized by malnutrition, hypotension, and the absence of reflexes. The tone in the legs increases, reflexes, the Babinsky reflex, increase. Where is the fireplace?

a) thickening of the cervix
b) At the level C1 - C4
c) at the level D3 - D4
d) at the level of the intersection of the pyramidal paths
e) At the level C1 - C8

49. When is an increase in tendon reflexes noted?

a) if the reflex arc is damaged
b) in violation of the pyramidal path
c) with damage to the anterior horns of the spine
d) with damage to the anterior roots of the spine
e) with damage to the plexus

50. When is a decrease in tendon reflexes noted?

a) with damage to the anterior horns, roots, nerves, plexuses

b) in case of damage to the side columns
c) with damage to the medulla oblongata and spinal cord
d) with damage to the cerebral artery
e) in case of damage to the pyramidal tract

51. The essence of the concept of hematomyelia is as follows:
A. Bleeding into the spinal canal
B. Hemorrhage in the skull
B. Spinal bleeding
D. bleeding into the subarachnoid space
E. Cerebral hemorrhage

52. Decompressive laminectomy is called:
A. The dura mater is not sutured at the end of the operation
B. The dura mater and back muscles are not sutured at the end of the operation
C. At the end of the operation, only the back muscles are not sutured
D. At the end of the operation, the resected bone fragments are replaced
E. The wound is tightly sutured

53. A 20-year-old patient was admitted to the emergency department with complaints of moderate pain and limited movement in the neck. There are no motor or emotional disorders. Radiographically, the spine of the uterus reveals a subluxation of the 1st spine of the uterus. Your next tactic.

Initial diagnosis:
A. Spinal cord injury. Atlas subluxation without spinal obstruction.
B. closed subluxation of the atlas in spinal injury
C. 1 cervical spine with subluxation of the uterine spine
D. Cervical-occipital injuries with radical pain

54. A 24-year-old car driver was brought from the scene with complaints of pain in the uterine spine, weakness in the arms, immobility in the legs. In the imagination, upper paraparesis, lower paraplegia, disorders of the pelvic cavity, hypoesthesia, permeable to the level of the C7 segment on both sides.

Initial diagnosis:
A. Spinal cord injury. Closed anterior VC5, contusion, compression and complete obstruction of the spine.
B. Closed subluxation of the atlas in spinal contusion with tetraparesis
C. 1 cervical spine with subluxation of the uterine spine
D. Cervical-occipital injuries with radical pain

55. A 34-year-old patient was admitted to the emergency department in a serious condition. According to my comrades, an hour before entering, I drowned in the river and at the same time hit my head on the bottom.

Immediately there were pains in the neck, weakness and sensitivity in the arms and legs. X-ray of the cervix revealed an anterior fracture-dislocation of VC 6.

Determine treatment method:

A. Anterior decompression at VC 6 with spinal intermittent fusion

B. Lionectomy VC 6 with fusing wire

C. vertebroplasty with bone cement from the posterior transpedicular inlet

D. According to Klovar,

E. posterior fusion

56. Patient R., 40 years old, fell from a height of 4 floors 30 minutes before the entrance. Sopor-coma of the 1st level of consciousness. The upper limbs respond to painful stimuli with flexion movements, while the lower limbs do not move. A local patient has autohemolychorrhea from the left external auditory canal. An x-ray of the skull reveals a temporary fracture of the bone with a transition to the base of the skull. X-rays revealed compression fractures of the body of 12 thoracic vertebrae, 12 thoracic and 1 lumbar vertebral vessels. initial diagnosis.

A. Combined SSP, severe brain contusion. Transient fracture of the temporal bone on the left, transition to the base of the skull, autohemolycorrhea on the left. Fracture of the body and arms VTh12, complete violation of the patency of the spine.

B. Combined BMI. Fisting.. Complex fracture VTh12.

C. OST. Brain compression. brain coma. Fracture of the thoracic spine.

D. Traumatic brain injury. Brain injury. Thoracic hematoma syndrome.

57. A 53-year-old female patient developed severe weakness in her arms and pain in the uterine spine after a whiplash injury in a traffic accident. Objectively: consciousness is clear, upper paraparesis with the distal pleura, sensitivity is distinct, there is no pathology in the pelvic organs. Full movement in the legs. X-ray without pathology of the cervix.

Initial diagnosis:

A. Spinal cord injury. Cervical spine with hematomyelia syndrome

B. closed subluxation of the cervical vertebrae in spinal injury

C. Acute traumatic myelitis of the cervical spine

D. Cervical-occipital injuries with radical pain

58. Patient O., aged 22, in serious condition. 1 hour before the appointment, he fell from a tree about 3 m high. Lower deep paraparesis with a transition to plegia in the distal sections, impaired sensitivity and function of the pelvic organs in the neurostat. Compression fractures of

bodies VL1-VL2 and VL1 of 3rd degree on spondylograms.

Initial diagnosis:

A. Compression fractures of the tertiary bodies VL1-VL2 and the left spring VL1, completely disrupting the patency of the spine.

B. Syndrome of traumatic hematoma of the thoracolumbar region.

C. Acute traumatic myelitis of the lumbar spine

D. Traumatic brain injury. Injuries of the spine and pelvic organs.

59. Initial stage of hemilaminectomy:

A. Skeletonization of spin processes on both sides

B. Resection of the medial parts of the articular processes

C. Resection of spinological processes

D. Resection of both halves of the arch

E. Skin and soft tissue incision

60. In the acute period of spinal injury, the following are observed:

A. Hemodynamic and microcirculatory disorders in the brain

B. Spinal tumor

C. liquor

D. spinal shocks

E. True

61. For closed injuries of the spine, except:

A. Skin crushing

B. Ssadin

C. Subcutaneous hematoma

D. Wounds affecting the spine

E. Combination of spinal fracture with skin injury

62. The best way to separate urine in spinal cord injuries:

A. Monroe drainage;

B. Permanent

C. Intermittent catheterization

D. urinary incontinence;

E. Suprapubic stream;

63. Method of immobilization in case of neck injury:

A. Shants type collar;

B. Laying on a hard surface;

C. lying on the stomach;

D. Kramer tire coating;

E. Immobilization is not required;

64. Reliable method of neck immobilization in case of hospital injury:

A. With subluxation without neurological symptoms;

B. Glisson's gravitational loop;

C. Premerger: Collar
D. Shants;
E. skeletal traction;

65. Transportation of the victim with a cervical injury:
A. Lying on your back;
B. with a raised nape;
C. on the stomach;
D. side;
E. sit;

66. Transportation of a victim with a thoracic spine injury:
A. on the back;
B. on the stomach;
C. on the side;
D. sit;
E. All of the above;

67. Transportation of a victim with a lumbar spine injury:
A. lying on the stomach;
B. sit;
C. Lying on your back;
D. lies next to him;
E. lying on your back with bent legs;

68. The main symptom of a growing cervical spine:
A. respiratory failure;
B. Paralysis of the hands;
C. Paralysis of arms and legs;
D. fever;
E. high blood pressure;

69. The main symptoms of spinal shock are:
A. hollow paraplegia;
B. paralysis of the legs;
C. sensory disorders;
D. urinary incontinence;
E. decrease in blood pressure;

70. Skeletal traction in spinal injury:
A. with a compression fracture of the vertebral body;
B. When the disc cracks;
C. With a broken bow
D. with an "explosive" fracture;
E. with a combined fracture of the vertebral body;

71. The main factors of spinal compression in compression fractures are:
A. traumatic disc herniation;

B. torn ligament;
the wedding of V.
C. Urban;
D. arch of the vertebra;
E. hematoma;

72. What kind of compression is preferable for compression fractures of the vertebral bodies?

A. old;
B. back;
C. Lateral;
D. internal;
E. All types;

73. The most common factor of spinal compression in bruises:

A. tumor of the spine;
B. accumulation of cerebrospinal fluid;
C. hematoma;
D. wedding;
E. Epiduritis;

74. Compression of the spine in the acute period is characterized by the following:

A. Flaccid paralysis, lack of response to skin pressure;
B. Spastic paraplegia, anesthesia;
C. Spastic paraparesis, hypesthesia;
D. pain in the legs;
E. Presence of pathological reflexes;

75. Specific symptoms of spinal cord compression:

A. Increasing spastic paraparesis;
B. Spastic paraplegia;
C. hypoesthesia;
D. disorder of deep sensitivity;
E. Radicular syndrome;

76. Main indications for surgical treatment of hematomyelia:

A. Proliferation of conductive diseases;
B. onset of pain;
C. blood in the cerebrospinal fluid;
D. increased blood pressure;
E. the appearance of meningeal symptoms;

77. Indications for surgical treatment of compression fractures of the spine:

A. Compression of the spine
B. pain;

C. Kyphotic deformity;
D. scoliosis;
E. shock;

78. The most sensible acquaintance with the roots of the ponytail:
A. Laminectomy;
B. Fatty;
C. starobokova;
D. senile lateral extraperitoneal;
E. hemilaminectomy;

79. Symptoms of spinal cord injury:
A. Wound fluid;
B. Bleeding
C. Sensory disturbances;
D. the presence of a wound;
E. Paraplegia;

80. The main point associated with the penetration of PST into the spinal cord
A. Hermitization of the dura mater;
B. Wound healing;
C. cessation of bleeding;
D. add solutions;
E. Prescribing antibiotics;

81. Signs of spinal injury;
A. Brown-Séquard syndrome;
B. paralysis of the legs;
urinary disorders;
C. bedsores;
D. pain;

82. The main risks in paravertebral injuries:
A. injuries of internal organs;
B. Bleeding
C. spinal injury
D. concussion of the spine;
E. spinal cord injury;

83. Symptoms of injury of the thoracic spine through the wound:
A. Wound fluid;
B. Light paralysis;
C. Anesthesia according to the degree of damage;
D. retention of feces and urine;
E. All of the above;

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