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ANALYSIS OF THE INFLUENCE OF VARIOUS FACTORS ON THE COURSE OF NEUROLOGICAL DISORDERS IN CHILDREN WITH SPINAL CORD INJURY

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Background. The study of the influence of various factors on the course of recovery of neurological disorders in children with spinal cord injuries is an important and relevant problem. The main causes of thoracic and lumbar injuries of the spine in children are road accidents and catatraumas. Anatomical and physiological features of the spine and spinal cord in children have a significant influence on the nature of spinal cord injury, clinical manifestations of the injury, and method of treatment. The degree of spinal canal deformity at the level of the damaged segment is directly proportional to the severity of the neurological disorder. The time between injury to when surgery is performed will strongly influence the nature and course of recovery of motor functions.

Aim. To assess the influence of different factors in pediatric patients with complicated injuries of the spine at the thoracic and thoracolumbar levels on the recovery of neurological disorders.

Materials and methods. The analysis of results of the surgical treatment of 36 children (24 boys and 12 girls) aged 3–17 years with damage to the spine and spinal cord in the thoracic spine and thoracolumbar junction, accompanied with neurological deficit in the form of central or peripheral paresis and paralysis, was performed. All patients underwent surgical intervention depending on the type and extent of damage. Clinical methods (i.e., detailed neurological examination) as well as X-ray, CT, and MRI were used as diagnostic methods.

Results. The study revealed that the most severe damage concerning neurological disorders in children with spinal cord injury occurs in the thoracic spine. The extent of neurological changes depends not only on the level of damage to the spinal column but also on the magnitude of spinal canal stenosis. Surgery performed in the first hours of the injury leads to a more rapid and full recovery of the neurological deficit.

Conclusion. Therefore, this study found that several factors influence the recovery of neurological disorders in children with spinal cord injury: timing of surgery, localization of the injury, spinal stenosis, the nature of lesions of the spinal cord, and the elements involved.

Keywords: spinal trauma and spinal cord trauma in children, spinal cord injury, ASIA scale, spinal surgery.

Introduction

According to the Russian literature, the incidence of all spinal injuries in children is reported to be 1%–10%, with a range from 1.9 to 19.9 cases per million children [1]. Statistics from children's hospitals in St. Petersburg between 2012 and 2013 indicate that from 900 to 1100 children annually suffer from spinal fractures of different locations, with unstable and complicated spinal injuries accounting for 2%–3% [2]. Concomitant injury of the spine and spinal cord in children occurs in 2%–5% of the total number of severe spinal injuries; however, according to other authors, spinal fractures in pediatric patients are accompanied by one kind of spinal cord injury or another in 20%–34.5%. This contradicts the presumed rarity of complicated spinal fractures in children [3].

Neurological symptoms, which occur with spinal cord injury in the thoracic and lumbar spine, are very diverse and depend on many factors: the exact nature of the spinal fracture, the degree of spinal stenosis, the severity of spinal cord and its roots' injury (concussion, contusion, compression, hemorrhachis), as well as the timing of surgical treatment. The relationship between these factors can affect recovery after surgical intervention for neurological disorders.

Dysfunction of spinal tracts in the thoracic spine, zone of lumbar enlargement, cauda equina, and spinal roots may be observed as a result of trauma as a direct result of injury, compression with bone fragments of the injured vertebral bodies, and dislocation of disc fragments to the spinal canal. Furthermore, subsequent development of vascular disorders also influences the development and progression of neurological impairment [4].

According to the literature, patients with injury localized in the thoracic spine have the most severe neurological disorders because of the unique anatomic features of this spinal segment structure [4]. The distinguishing features of this spinal region are narrowness of the spinal canal and a limited (slit) space between its walls and the dural sac. As a result, even a relatively small compression with bone fragments or intervertebral disk substance may lead to pronounced neurological deterioration.

The extent of spinal canal deformation at the level of the injured segment directly influences the intensity of neurological disorders. For instance, severe neurological disorders in the form of complete dysfunction of spinal cord conduction are observed in spinal kyphosis over 200 degrees and in horizontal dislocation of vertebral body fragments at least 6 mm in dislocation fractures [5].

The time passed from initial onset to surgical intervention has a significant effect on the nature of neurological disorders and recovery of motor functions. Some authors propose that early surgical intervention after injury has no influence on the rates of neurological impairment recovery, and conversely, may lead to deterioration. Furthermore, there is also no agreement on the definition of time limits for early surgical treatment. Asawma et al. considers the first 4 weeks after the injury as the early period for surgical treatment [6], Farmer et al. the first 5 days [7], Vaccaro and S. Mirsa the first 3 days (72 h) [8-9], and Wagner and Chehrazi the first 8 h from the moment of injury [10].

For comparison, Vaccaro et al. revealed no difference in neurologic outcomes between a group of patients with cervical spine injury who were operated on within the first 72 h from the moment of injury and a group of patients who were operated on 5 days after injury [8]. To evaluate the effect of persistent compression of the spinal cord on functional neurologic recovery after the spine and spinal cord injury, Wagner and Chehrazi reviewed 44 cases with injury at vertebral levels S3–S7 [10]. They evaluated the nature of neurological disorder intensity with the degree of spinal stenosis and the time of surgical intervention from the moment of injury. In the first group of patients, the decompression and stabilization of the injured vertebral segments were performed in the first 8 h from the moment of injury, and the surgical treatment was conducted within 48 h in the second group. The results were evaluated immediately after the intervention and 1 year thereafter. The neurological impairment present at admission completely correlated with the degree of spinal stenosis; however, no significant difference in the course of neurological disorder regression in both studied groups was revealed. The authors concluded that the primary spinal cord and spine injury remains the key factor that defines neurological outcome for any given patient. Fehlings et al. propose that there are no generally accepted standards for the role and timing of surgical decompression, but at the same time, they state that early surgical intervention (up to 24 h) should be performed in those patients who have pronounced neurological symptoms [11].

Bohlman and Anderson presented the results of analysis for 58 operations in a delayed period (from 1 month to 9 years since the moment of injury) in patients with spine and spinal cord injuries. In the study group, 29 patients started walking after the operation, and 6 patients who had walked before the operation started to ambulate much better [12]. Only nine of them showed no improvement in neurological state; however, the authors do not indicate at what time after the operation the improvement occurred. They also state that improvement may occur without any operation.

Aganesov et al. propose that the efficacy of surgical treatment in complicated spinal injury during acute and early periods mostly depends on the timing of surgical intervention; they emphasize rapid decompression and stabilization of the injured vertebro-motor segment [1].

Spinal cord ischemia is an integral part of traumatic injury. Compression of spinal cord vessels without traumatic injury of cells leads to ischemic necrosis, development of an inflammatory reaction, and induces apoptosis. Following 180-min compression of spinal cord vessels, completely irreversible changes in neurons occur [13]. According to Lutsik, in spinal cord compression, as a rule, the main vessels are compressed, particularly the anterior spinal artery and branching central spinal cord arteries [14]. This dictates the necessity to perform decompression as soon as possible; otherwise, irreversible changes in the spinal cord may occur. A quantitative analysis of acute axonal pathology in experimental contusion of the spinal cord shows the general tendency in injury: within 15 min, the grey matter is injured, and the white matter becomes involved within 4 h. Slow development of white matter injury gives a therapeutic window for slowing the pathological process [15].

Our study objective was to evaluate the influence of different factors on neurological disorder progression in children with spine and spinal cord injury in the thoracic spine and in the thoracolumbar transition zone.

Material and methods

An analysis of surgical treatment outcomes was conducted in 36 children (24 boys and 12 girls) at the ages of 3–17 years. Patients presented with spine and spinal cord injuries in the thoracic spine and the thoracolumbar transition zone accompanied by neurological disorders in the form of central or peripheral paresis and paralysis. Patients over 11 years accounted for 77.8% of the total number of patients (table 1).

The main causes of spine and spinal cord injuries in children were motor vehicle collisions in 19 cases (52.8%) and catatrauma in 17 (47.2%).

For all patients in this study, detailed neurological examinations, radiography of the injured spine segment, and computer and magnetic resonance imaging data were collected. The evaluation of spinal stenosis was performed by axial and sagittal scans of computer imaging with mathematical calculation of the data obtained. For the purpose of maximum standardization of the clinical study results, the ASIA scale developed by American Spinal Injury Association and included score evaluation of muscular force and sensitivity (tactile and pain) was used [16].

According to the data represented in Table 2, it was determined that, in 36 patients, 16 patients had an initial level of type A neurological disorder, 14 patients had type B, 4 patients had type C, and in 2 patients, neurological impairment complied with type D based on the ASIA scale. It is also necessary to emphasize that a syndrome of complete dysfunction in spinal cord conduction was revealed in 12 patients with spine and spinal cord injury at the thoracic spine level and in 4 children with an injury in the thoracolumbar transition zone.

To evaluate the nature of spinal fractures, the classification system of Magerl et al. was used [17]. Fractures of type A3 were revealed in 18 (50%), type B in 2 (5.6%), and type C in 16 (44.4%) children. The spinal injuries were distributed as follows: thoracic spine in 16 (44.4%) patients and thoracolumbar transition (Th10-L2) in 20 (55.6%) patients.

Table 1

Distribution of patients with complicated injuries in the thoracic spine and the thoracolumbar transition zone by age

Age	3–7 years old	7–11 years old	11–17 years old	Total
Boys	4	4	16	24 (66,7 %)
Girls	–	–	12	12 (33,3 %)
Total	4 (11,1 %)	4 (11,1 %)	28 (77,8 %)	36 (100 %)

Table 2

Distribution of patients with complicated spinal injuries depending on the type of neurological disorders and injury localization

Groups	Injury localization	Type of neurological disorders based on the ASIA scale				Total
		A	B	C	D	
I	Thoracic Thoracolumbar	2 –	– 6	– –	– –	8
II	Thoracic Thoracolumbar	– 2	– –	– –	– 2	4
III	Thoracic Thoracolumbar	2 –	– 2	– 4	– –	8
IV	Thoracic Thoracolumbar	8 2	4 2	– –	– –	16
Всего	Thoracic Thoracolumbar	12 4	4 10	– 4	– 2	16 20

Surgical intervention was performed in all patients using combined or dorsal access with fixation of the injured vertebromotor segment and decompression of spinal cord structures and surrounding elements [2, 3, 4]. In patients with injuries of types A and B by the Magerl classification, surgical intervention was performed simultaneously using two access points. Using dorsal access, posterior indirect reposition and stabilization of the injured vertebral-motor segment with posterior local spondylosyndesis were performed. Decompression of the spinal cord and surrounding elements was performed using anterior lateral thoracic, lumbotomic, or thoracophrenolumbotomic access through the removal of bone fragments of the broken vertebra, spinal anatomy restitution, and reconstruction of anterior and median columns at this pyramesh level combined with bone grafting. In fractures of type C, surgical intervention was completely performed using posterior access. The objective of the operation was to eliminate all forms of vertebrae dislocation in the injured vertebral-motor segment by means of multiple-seated hardware and restoration of the injured vertebral segment to the physiologically normal position both in frontal and sagittal planes. This was performed following spinal cord decompression and spinal canal revision. The operation was completed with the formation of vertebral fusion and posterior local spondylodesis.

Following hospitalization, all patients with neurological disorders received hormonal therapy according to recommendations by the NASCIS-I protocol: bolus dosing of 30 mg/kg of methyprednisolone in the first 6 h, then 5.4 mg/kg per hour during the next 23 h.

After the operation was completed, patients continued to receive methylprednisolone at a dosage of 5.4 mg/kg per hour for the next 48 h. In the early postoperative period under stable hemodynamic conditions, the following procedures were conducted:

1. Dehydration therapy (Lasix 2–3 mg/kg per day in 3–4 doses),
2. Anticoagulation reversal (Dicynone 3–7 mg/kg four times a day),
3. Around 2–3 days after the operation, vasoactive agents were prescribed (Nimotop 5–10 ml/h for 10–14 days),
4. Vitamins B supplementation (Neuromultivit).

Therapy with vasoactive agents was administered if there was no risk of continued bleeding, and patient hemodynamics remained stable.

In addition, all patients received intensive medical rehabilitation, which included passive therapeutic exercises (several times a day), limb massage, special positioning, and motor rehabilitation using mechanotherapy and multirobot systems.

The average duration of hospital treatment for patients with complicated spinal injuries in the thoracic spine and thoracolumbar transition was 24 days. Children were subsequently transferred to rehabilitation centers where they could continue their medical rehabilitation. After discharge from the hospital, the patients continued to receive drug therapy.

During the study, the influence of different factors in pediatric patients with spine and spinal cord injury on changes in neurological disorders after surgical treatment was evaluated. The multifactor evaluation in patients with complicated spinal injuries in the thoracic spine and thoracolumbar transition zone was conducted based on the following criteria:

- intensity of neurological disorders depending on the level of injury,
- time of surgical intervention from the moment of the injury,
- changes in neurological disorders after the operation (based on the ASIA scale).

Monitoring of changes in neurological state was conducted at the early postoperative period (daily during 1 week, thereafter once every 2–3 days during the whole period of the patient's hospitalization). Subsequently, the patients were examined once every 6 months, with necessary registration of the neurological examination data in the spinal injury protocol. Long-term treatment outcomes were monitored within a 5-year period in all patients.

Results

During the study, it was revealed that spinal fractures in the thoracic spine result in more severe spinal cord injuries in terms of neurological disorders. In 16 patients with localization of the injury in the thoracic segment, we observed the most severe type of neurological deteriorations (A and B based on the ASIA scale), with 12 patients showing type A and only 4 showing type B. Twenty patients with localization of spinal injury in the thoracolumbar transition zone showed all types of neurological disorders, from type A to type D, with 50% (10 children) of patients having type B neurological impairment based on the ASIA scale.

The time from injury to the time of surgical intervention in patients with spine and spinal cord injuries varied from a few hours to 18 months. All patients were thus divided into four groups. As can be seen in Table 3, eight children were operated on in the first 6–12 h after injury and four patients in the acute period of vertebral-medullary injury (from 12 h to 3 days). Eight patients underwent surgical treatment in the early period after the injury (from 3 days to 2 weeks) and 16 children in the intermediate and late periods (from 14 days to 18 months).

Consequently, most of the patients were operated on in the intermediate and last period after the injury.

During surgical treatment, in all patients with spine and spinal cord injuries, complete improvement of spinal stenosis was achieved; thus, there was spinal cord decompression and spinal canal anatomy restitution (Table 4).

Table 3

Distribution of patients by the nature of spinal injury and the time of surgical treatment

Nature of injury Localization Time of Surgical treatment	Type A3		Type B		Type C		Total
	Thoracic	Thoraco-lumbar	Thoracic	Thoraco-lumbar	Thoracic	Thoraco-lumbar	
The first 6–12 h since injury (I group)	–	6	–	–	2	–	8
12 h–3 days (II group)	–	2	–	–	–	2	4
3 days–14 days (III group)	–	4	–	–	2	2	8
Over 14 days(IV group)	4	2	2	–	6	2	16
Total	4	14	2	–	10	6	36

Table 4

Parameters of spinal stenosis before the operation and in the early postoperative period

Groups	Injury localization	Spinal canal stenosis, %	
		Before the operation	After the operation
I	Thoracic	от 90 до 97 93,5 ± 3,5	0
	Thoracolumbar	от 73 до 94 83,7 ± 6,7	0
II	Thoracolumbar	от 42 до 88 65,0 ± 22	0
III	Thoracic	от 96 до 100 98,0 ± 2,0	0
	Thoracolumbar	от 44 до 82 53,7 ± 18,2	0
IV	Thoracic	от 18 до 100 63,8 ± 18,7	0
	Thoracolumbar	от 46 до 73 59,0 ± 12,0	0

Notes: The table provides selective limit values and mean ± standard deviations.

The spinal stenosis was more severe in group I patients than the other groups and, on average, equaled 93% in the thoracic spine and 84% in the thoracolumbar transition zone.

Among children from all groups in the early postoperative period, the neurological impairment regression in the form of motor and sensitive function (pain, tactile) recovery was revealed, on average, by 1–2 scores on the ASIA scale during neurological examination, with faster recovery of pain sensitivity.

Neurological functions (motor and sensation) improved on days 1–2 after surgical treatment in patients from the first group when surgical decompression was performed, on days 2–3 in patients from the second group, on days 5–7 from the third group, and in 4–5 months from the fourth group. Faster recovery was observed in patients from the first group (six children) who had type B neurological disorders based on the ASIA scale and were operated on within the first 6–12 h after the injury.

After evaluation of the long-term outcomes, the following results were revealed:

Group 1. In six patients with an incomplete disorder of spinal cord conduction, we found pronounced changes in the form of significant sensitivity disorder regression: their recovery to the normal function (type E) was demonstrated in three patients, whereas the level of pain and tactile sensitivity increased, on average, by 18 scores from the initial values in the other three patients. For motor function, these patients showed an increase of parameters, on average, by 26 scores from the primary neurological examination data. In the later period (5 years) after surgical treatment in children from this group, motor parameters conformed to 71 scores (from 50 to 100) and sensitivity parameters to 85 scores (from 54 to 112); four patients started to move without support, two of them required additional devices. Two patients with an initial level of neurological impairment which conformed to type A showed no changes in their clinical patterns. Lower paraplegia and bowel and bladder dysfunction persisted.

Group 2. Two patients with an initial type D disorder based on the ASIA scale showed complete regression of neurological disorders. In two other patients with initial neurological disorders of A type based on the ASIA scale, no regression of neurological symptoms was revealed. In the long-term period post-spine and spinal cord injury, the mean values of motor function conformed to 73 scores (50–97) and 95 of sensitivity function (78–112).

Group 3. Four of eight patients showed positive changes, with the changes of neurological impairment level from type C to type D, and two patients went from type B to type D. Two children with type A neurological disorders showed no regression. In the long-term period after surgical treatment, motor functions, on average, were evaluated as 77 scores (from 50 to 93) and 91 scores on sensitivity functions (from 38 to 107). The increase of sensitivity parameters, on average, equaled 10 (from 6 to 15) scores and motor parameters were 19 (from 0 to 34) scores. By the 4th–5th year of the follow-up period, the development of neurological disorder recovery completely stopped.

Group 4. Patients from this group, with incomplete disorders in spinal cord function, also showed some improvement of neurological state after the operation, but their rate was slower. Of 16 patients from this group, six children who initially had type B of neurological disorders based on the ASIA scale had regression to type C by the 2nd–3rd year of the follow-up period. Ten patients with level A neurological impairment based on the ASIA scale showed no positive changes in their neurological state. Evaluation of motor functions in the fourth group of patients conformed, on average, to 59 scores (from 50 to 82) and 67 scores in sensitivity functions (from 24 to 84).

Special attention should be paid to 16 patients from all groups, whose neurological disorders were initially evaluated as type A based on the ASIA scale. Regardless of the timing of surgical treatment, these patients did not regain the ability to freely move their lower limbs. The development of sensitivity functions was characterized by slow recovery in the long-term period (over 2–3 years after surgical treatment), but no more than by 5–8 scores from the initial level.

DISCUSSION

According to our results, it was determined that patients with spinal injury in the thoracic spine had more severe neurological disorders than those with fractures in the thoracolumbar transition zone. In our opinion, this is directly related to the size of the spinal canal in the thoracic spine, which is smaller than the thoracolumbar segment. As a result, there is limited space available for the spinal cord, and in the case of spinal fractures, clinical intensity of neurological disorders is more significant than in inferior segments.

It has been previously suggested that earlier surgical intervention in patients with spine and spinal cord injury is associated with more rapid and complete recovery of neurological disorders. The exception is patients with type A neurological impairment based on the ASIA scale, in whom we observed no recovery of spinal cord motor function in any case; however, we did see positive changes in the sensitivity functions in children with type A disorders who were operated on in the initial hours after the injury, in the form of an increase of scores on the ASIA scale.

Patients from the first group before surgery had the most pronounced spinal stenosis among all groups of patients, which on average was 93.5 ± 3.5% in the thoracic spine and 83.7 ± 6.7% in the thoracolumbar transition zone. This group of patients showed pronounced neurological disorders of type A (2) and B (6) based on the ASIA scale. In our opinion, absence of neurological disorder progression in this group of patients with type A injury was due to the level of injury (thoracic vertebra), pronounced spinal stenosis at this level, and functional discontinuance of the spinal cord.

Patients from this group with type B neurological impairment after surgical intervention had significantly higher regression of neurological disorders than the other study groups. Furthermore, it was determined that the recovery of motor and sensitivity functions occurred at higher rates (on the 1st–2nd day after the operation). Such positive changes in children from the first group may be explained by early decompression of the spinal cord and its elements combined with stabilization of the injured vertebral-motor segment. In our opinion, it was compression of spinal cord and its elements by bone splinters of vertebral bodies in this group of patients that was the main reason for neurological disorders. The conducted surgical operation during the initial few hours after injury allowed not only the removal of the cause of spinal cord compression but also the ability to restore the anatomy of spinal canal as well as preventing edema, circulatory disorders, and development of secondary pathological irreversible processes.

Patients from the second group had less pronounced spinal stenosis after the injury (65.0 ± 22) compared with patients from the first group. This fact also conformed to the variants of neurological disorders- type A (2) and D (2) based on the ASIA scale.

In two patients with type A neurological disorders based on the ASIA scale, the absence of motor and sensitivity functional recovery was related to the pronounced spinal canal stenosis (on average 87%) at the level of the thoracolumbar transition and severity of the spinal cord injury.

In spite of the delayed surgical operation in this group of patients, complete regression of neurological impairment was observed in two children with type D disorders; however, the rates of recovery were slower (on the 2nd–3rd day after the operation) than those observed in the first group of patients. In our opinion, recovery of neurological disorders in these patients was related to the insignificant impairment (type D) and the level of spinal cord injury (thoracolumbar transition).

Patients from the third group, prior to surgery, had spinal stenosis of 98.0 ± 2.0 in the thoracic spine and 53.7 ± 18.2 in the thoracolumbar transition zone. The extent of canal stenosis in the thoracolumbar transition zone in this group of patients was the smallest among all groups. This group of patients showed the following types of neurological disorders based on the ASIA scale: A (2), B (2), and C (4). Such types of impairment may be explained not only by the level and extent of spinal stenosis but also by the occurrence of edema and secondary pathological processes in the spinal cord. Patients from this group with type A neurological disorders showed no recovery of both motor and sensitivity spinal cord function. Delayed surgical intervention led to slow (on days 5–7 after the operation) regression of neurological impairment and insignificant changes in patients with type B (2) and C (4) neurological disorders. These patients showed transition from the initial level of neurological impairment before the operation to level D; they also exhibited complete cessation of positive changes in recovery by the 4th–5th year after surgery. In our opinion, such changes in neurological disorders were mostly related to the small size of spinal stenosis in the thoracolumbar transition zone (in this zone, one can observe injuries of types B and C) immediately after the injury, which was completely eliminated during the course of surgical intervention.

Patients from the fourth group had a spinal stenosis of 63.8 ± 18.7 in the thoracic spine and of 59.0 ± 12.0 in the thoracolumbar transition zone. Among all other groups, this category of patients showed the smallest degree of spinal stenosis. These patients as well as patients from the first group showed pronounced neurological disorders of type A (10) and B (6) based on the ASIA scale. Taking into account less pronounced spinal stenosis in this group of patients, we may assume that the neurological disorders were not solely a result of compression of the spinal cord and its elements by bone fragments of vertebral bodies. We suggest that the main causes of neurological impairment in this period after the injury were due to vascular disorders and secondary pathological processes that occurred in the spinal cord. These changes and delayed surgical operation led to no positive changes of neurological disorders in any patient with a type A neurological disorder. In our opinion, it was due to the severity of the spinal cord injury and irreversible pathophysiological changes occurring as a result of the injury. The exception was six patients who progressed from type B neurological impairment to type C only by the 2^{nd}–3^{rd} year after surgery.

Patients from all groups with type A neurological disorder showed no recovery of motor function. This can be explained by the severity and intensity of the spinal cord injury. Slow recovery of sensitivity functions was seen in patients with complete injury of the spinal cord (type A) in the long-term follow-up period. This is most likely related to neuroplasticity and adaptative potential of the spinal cord in pediatric patients.

CONCLUSION

We determined that the most severe injuries, from a neurological point of view, occurred in children with spine and spinal cord injuries from thoracic spine fractures. The nature of neurological changes depends not only on the level of the vertebral injury but also correlates with the extent of spinal stenosis. Surgical intervention during the first few hours after the injury leads to more rapid and adequate recovery of neurological functions. Surgery should be accompanied by complete elimination of all causes of spinal cord compression, restoration of spinal canal anatomy and physiological profiles at the level of the injured vertebro-motor segment, and stable fixation in the long-term follow-up periods. Timely elimination of spinal cord compression during the first 6–12 h after injury leads to successful recovery of spinal cord functions and regression of neurological disorders. Functional recovery of even a single segment of the spinal cord significantly improves social adaptation and quality of life in patients who experience a spinal cord injury.

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АНАЛИЗ ВЛИЯНИЯ РАЗЛИЧНЫХ ФАКТОРОВ НА ДИНАМИКУ НЕВРОЛОГИЧЕСКИХ НАРУШЕНИЙ У ДЕТЕЙ С ПОЗВОНОЧНО-СПИННОМОЗГОВОЙ ТРАВМОЙ

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Актуальность. Изучение влияния различных факторов на динамику восстановления неврологических нарушений у детей с позвоночно-спинномозговой травмой является важной и актуальной проблемой. Основными причинами повреждений грудного и поясничного отделов позвоночника у детей являются дорожно-транспортные происшествия и кататравмы. Возрастные анатомо-физиологические особенности позвоночника и спинного мозга у детей оказывают существенное влияние на характер повреждения спинного мозга, клинические проявления травмы, а следовательно, и на выбор лечебной тактики. Величина деформации позвоночного канала на уровне поврежденного сегмента прямо пропорционально влияет на выраженность неврологических нарушений. На характер неврологических нарушений и динамику восстановления двигательных функций существенное влияние оказывают сроки оперативного лечения, прошедшие от момента травмы.

Цель. Оценить влияние различных факторов у пациентов детского возраста с осложненными повреждениями позвоночника на грудном и грудопоясничном уровне на динамику восстановления неврологических нарушений.

Материалы и методы. Проведен анализ результатов хирургического лечения 36 детей (24 мальчика и 12 девочек) в возрасте от 3 до 17 лет с повреждением позвоночника и спинного мозга в грудном отделе позвоночника и области грудопоясничного перехода, сопровождающимся неврологическим дефицитом в виде центральных или периферических парезов и параличей. Всем пациентам выполнено хирургическое вмешательство в зависимости от варианта и уровня повреждений. В ходе исследования использовали клинический (подробный неврологический осмотр), рентгенологический, КТ-, МРТ-методы диагностики.

Результаты. Проведенное исследование выявило, что наиболее тяжелые повреждения с точки зрения неврологических нарушений у детей с позвоночно-спинномозговой травмой возникают при локализации переломов в грудном отделе позвоночника. Характер неврологических изменений зависит от уровня повреждения позвоночного столба и коррелирует с величиной стеноза позвоночного канала. Операция, выполненная в первые часы от момента травмы, приводит к более быстрому и полноценному восстановлению неврологического дефицита.

Заключение. Таким образом, в ходе исследования установлено, что влияние на восстановление неврологических нарушений у детей с позвоночно-спинномозговой травмой оказывают многих факторы:

сроки хирургического вмешательства, локализация повреждения, стеноз позвоночного канала, характер поражения спинного мозга и его элементов.

Ключевые слова: травма позвоночника и спинного мозга у детей, позвоночно-спинномозговая травма, шкала ASIA, хирургия позвоночника.

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