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VIDEO-ASSISTED THORACOSCOPIC TREATMENT OF DISCOGENIC THORACIC MYELOPATHY

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Background. Clinically significant herniated intervertebral discs in the thoracic spine are quite rare, and the tactics of surgical treatment of patients with this pathology remains debatable. The thoracoscopic technique has a number of advantages such as shorter hospitalization period and less pronounced pain syndrome in the area of surgical intervention as compared to the standard intervention via posterior surgical access.
Aim. To evaluate the results of videothoracoscopic treatment of patients with discogenic thoracic myelopathy.
Material and methods. The article presents results of treatment of 21 patients hospitalized in the Federal Neurosurgical Center (Novosibirsk). According to results of examination, the patients were divided into 2 groups: with mild (10 patients) or ossified (11 patients) hernias. Each patient underwent video-assisted thoracoscopic microdiscectomy. The median follow-up was 29 (4 to 72) months.
Results. At the time of discharge, 18 (85.7 %) patients had no deterioration in their neurological status, 2 (9.5 %) had positive dynamics in the form of decrease in degree of hypertonicity and degree of lower paraparesis, 1 (4.75 %) had some deterioration in the status. A satisfactory result of the treatment in the late postoperative period was achieved in 14 (66.7 %) patients.
Conclusion. Video-assisted thoracoscopic surgery appears to be an effective and fairly safe method of surgical treatment of patients with discogenic thoracic myelopathy.

Keywords: intervertebral disc herniation, thoracic myelopathy, videothoracoscopy

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INTRODUCTION

Herniated thoracic intervertebral disc (HTD) is a rare disease. According to statistics, clinically significant HTD account for 1.5–4 % of all herniated discs diagnosis [1]. Surgical operations for the treatment of HTD include both open techniques and video-assisted thoracoscopic surgery (VATS) [2]. The thoracoscopic technique of removing HTD was first described by R.J. Lewis et al. in 1991 [3]. A number of studies have further shown such advantages of endoscopic techniques as shorter hospitalization period and less pronounced pain syndrome in the area of surgery as compared with the standard posterior surgery [4–6]. The tactics of surgical treatment of this group of patients continues to be discussed due to relative rarity of clinically significant HTD as well as severity of the course of thoracic myelopathy in this disease. Our study retrospectively evaluated the results of surgical treatment of HTD in patients with manifestations of thoracic myelopathy who had been operated with the use of video endoscopic transthoracic technique and analyzed the possible causes of complications in the early postoperative period and in the catamnesis.

The aim of the study was to evaluate the results of videothoracoscopic treatment of patients with discogenic thoracic myelopathy.

MATERIALS AND METHODS

Twenty-one video-assisted thoracoscopic operations were performed at the Federal Center for Neurosurgery of the Ministry of Health of Russia (Novosibirsk) from 2015 to 2021. The group of patients included 11 women and 10 men; the average age was 54.7 years (from 33 to 79 years). Each patient underwent a neurological examination the day before surgery, on the 1st day after surgery and in the catamnesis. To diagnose hernias and changes in the spinal cord before surgery, the examinations performed included multispiral computed tomography (MSCT) of the thoracic spine (TS) and lungs, magnetic resonance imaging (MRI)

and radiography of the TS in direct and lateral projections with functional tests. In the early postoperative period, all patients underwent MSCT and MRI of TS to evaluate results of the surgery (Fig. 1).

THE STUDY DESIGN

The criterion for inclusion in the study was presence (according to MSCT and MRI) of clinically significant HTD with development of spinal canal stenosis and spondylogenic thoracic myelopathy, the exclusion criteria were the presence of 5 or more scores according to the White and Panjabi criteria of instability, scoliotic deformity, traumatic spinal injury, diseases of the chest and infectious diseases. Taking into account the fact that most of the HTD have signs of calcification and ossification, and this, in turn, may complicate the main stage of surgery, the patients were divided according to MSCT into 2 groups: with mild (10 patients) and ossified (11 patients) hernias. Signs of ossification were recognized as increase in density of the hernial fragment up to 150–200 HU (according to MSCT) [7].

SURGICAL TECHNIQUE

The VATS technique remained unchanged in all patients in the study and was performed according to the recommendations presented in publication "Video endoscopic surgery of injuries and diseases of the thoracic and lumbar spine" (edited by V.V. Krylov) [8].

Each surgical intervention was performed with the patient being in lateral position. In transthoracic surgery anesthesia measures need a single-lung intubation. When choosing the side of thoracoscopic access, it is necessary to take into account the anatomical relationship of the aorta and spine as well as presence of liver in the right hypochondrium. Thus, it is safer to choose the right – sided approach for access to the Th2–Th8 vertebrae, and the left-sided approach for Th9–Th12.

Marking over the affected intervertebral disc was made under X-ray control with the help of an electron-optical converter. After that, the following working ports were installed: 1st – above the level of the affected intervertebral disc (for the working tool), 2nd – anteriorly from the 1st port at a distance of about 8 cm (for the endoscope) and 3rd – along the anteropodmuscular line 2 intercostals higher (for the aspirator). Next, the parietal pleura was dissected 3 cm distal from the medial edge of the rib head to the middle of vertebral body, retreating cranially and caudally from the disc edge by 1 cm (Fig. 2, *a*). At the next stage of operation, the rib head was resected to expose the intervertebral foramen and visualize the dura mater (DM) and hernial protrusion (Fig. 2, *b* and *c*). A dural hook and pliers were used to isolate and remove a herniated intervertebral disc (Fig. 2, *d*). The criterion for completion of the operation main stage was the absence of visible fragments of herniated intervertebral disc in the field of view, straightening and pulsation

Fig. 1. *Visualization of a herniated thoracic intervertebral disc at the stage of planning before the operation and evaluation of postoperative results: a, b – magnetic resonance imaging (MRI) of the thoracic spine (TS) and multislice computed tomography (MSCT) of the TS before surgery, demonstrating median calcified herniated intervertebral disc at the level of Th9–Th10 vertebrae; c, d – MRI and MSCT of the TS after VATS*

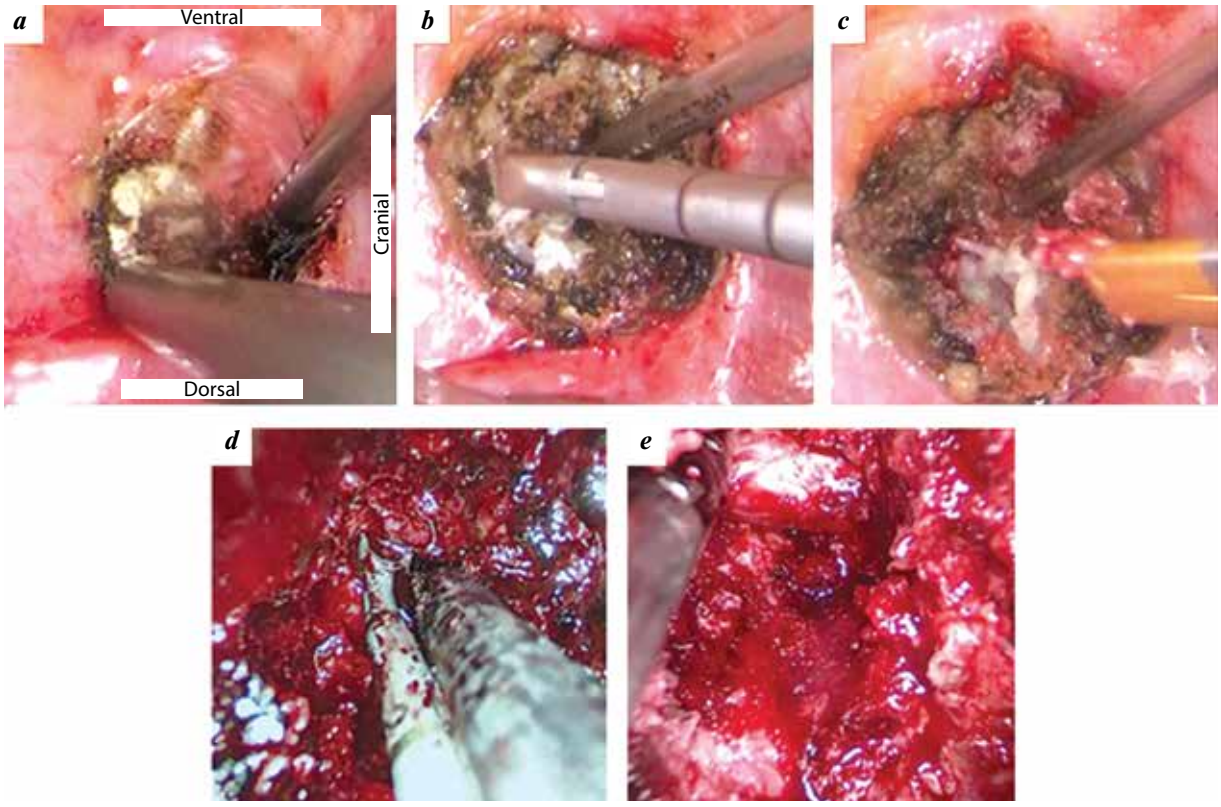

Fig. 2. *Stages of video-assisted thoracoscopic surgery: a – opening of the parietal pleura (orientation is given relative to the patient's position); b – removal of the head of the rib; c – discectomy; d – removal of a herniated intervertebral disc; e – the final result of decompression: in the upper part of the image there is an expanded dural sac without signs of compression.*

of the DM (Fig. 2, *e*). The next stage of the operation was hemostasis. A tubular single-light drainage was installed under the control of an endoscope in the pleural cavity at the level of 9th–10th intercostal space. After that, the trocars were removed and layer-by-layer suturing of the wound and straightening of the collapsed lung were performed.

STATISTICAL ANALYSIS

Statistical analysis was performed using the R software version 4.1.0 [9]. The data is presented as the mean/median (interquartile range). The two-tailed Wilcoxon test was used, and to compare the indicators to compare the measures taken before and after surgery. The two-tailed Mann–Whitney test and Fisher exact probability test were used to compare data from types of HTD. *P* equal to 0.05 was taken as the level of statistical significance.

The data in the paper are presented in the form of box-plot diagram where were indicated the median, interquartile range, the largest/smallest value of the sample which were within the 1.5 values of the interquartile range. The initial data is reflected in the diagram with small corrections that were made for better visualization.

EVALUATION CRITERIA

To assess the preoperative condition of patients and the results of surgical treatment, the Frankel grade neurological status assessment scale with 5 functional groups (from A to E) and the Ashworth 4-score spasticity scale were used.

To assess the patient's difficulty in walking, the Nurick scale of assessment of the degree of disability was used (for statistical analysis, the scores from 0 to 5 of the Nurick scale were used), to determine the severity of clinical symptoms of myelopathy – the 17-score modified Japanese Orthopedic Association (mJOA) and the 18-score European Myelopathy Scale (EMS). The scales were evaluated three times: the day before the operation, the 1st day after the operation and at time of discharge from the hospital. A dynamic monitoring of clinical condition of patients was thereafter carried out in periods of 6, 12 months or more. The average follow-up period after the intervention was 29 months (from 4 to 72).

RESULTS

Clinical evolution

All patients during preoperative period had manifestations of thoracic myelopathy in the clinical evolution, including lower paraparesis, hypertonus and hyperreflexia of the lower extremities and impaired pelvic organ function. The time between appearance of the 1st symptoms of the disease and the diagnosis was on average 1.9 years. In 4 (19 %) patients, the 1st sign of the disease was pain in the thoracic spine and only over time symptoms of thoracic myelopathy

appeared; the remaining 17 (81 %) patients initially developed symptoms of thoracic myelopathy in the form of lower paraparesis. At the time of hospitalization, most patients had several clinical manifestations of the disease (Fig. 3).

According to the Ashworth spasticity scale, there were no changes in muscle tone in 4 (19 %) patients, in 6 patients the changes corresponded to 1 score, in 9 patients – to 2 scores, in 2 patients the hypertonus was diagnosed (3 scores). Nine (42.9 %) patients reported symptoms of pelvic organ dysfunction. Neurological deficit on the Frankel scale during preoperative period ranged from B to D: in 2 (9.5 %) patients it corresponded to grade B, in 6 (28.6 %) – to grade C and in 13 (61.9 %) – to grade D. The severity of thoracic myelopathy was determined in all patients according to the mJOA scale: the average value was 12.3 scores (data ranged from 9 to 16), and according to the EMS scale – 13.5 (from 10 to 16). Before the intervention, each patient had difficulty during walking: the average value on the Nurick scale was 2.8 scores.

The level of HTD most often corresponded to Th10–Th11 and Th11–Th12 intervertebral discs: 10 (47.6 %) patients. The distribution of patients by HTD level is shown in Fig. 4.

In 17 patients, the HTD had a median location, in 2 – lateralization to the left and in 2 – to the right. According to results of MSCT and MRI of TS, the soft herniated intervertebral disc was detected in 10 cases, the ossified – in 11 cases.

In 7 (38.2 %) patients, degenerative lesions of other spine parts were noted, in the anamnesis of 1 (4.8 %) patient, an intervention for an intramedullary tumor of the cervical spinal cord was performed earlier (15 years before this operation). According to the neurological examination data, the existing neurological deficit in all patients corresponded to the level of HTD.

After dividing the patients into groups with soft and ossified hernias (Table 1) a statistically significant age difference was detected: in patients with mild hernias the age at the time of surgery was greater ($p = 0.041$). No other demographic differences were found between the groups.

In addition, it was revealed that these groups have a statistically significant difference from each other in the initial values according to the mJOA, EMS and Nurick scales ($p < 0.05$). The neurological status of patients with mild hernias was initially heavier than that of patients with ossified hernias (Table 2).

Intraoperative data

The average operation duration was 220/205 (170; 255) min (range 130–480 min), blood loss was 506/350 (150; 900) ml (range 20–1700 ml). In cases of transthoracic removal of ossified hernias of the thoracic spine blood loss was statistically significantly greater ($p = 0.006$). In 2 cases with blood loss of 1700 and 1000 ml hemotransfusion was required.

Unintentional durotomy occurred during 2 operations which required plastic surgery and installation of lumbar drainage.

Clinical evolution in the early postoperative period

When evaluating the results of the operation, it was revealed that early postoperative period had a certain

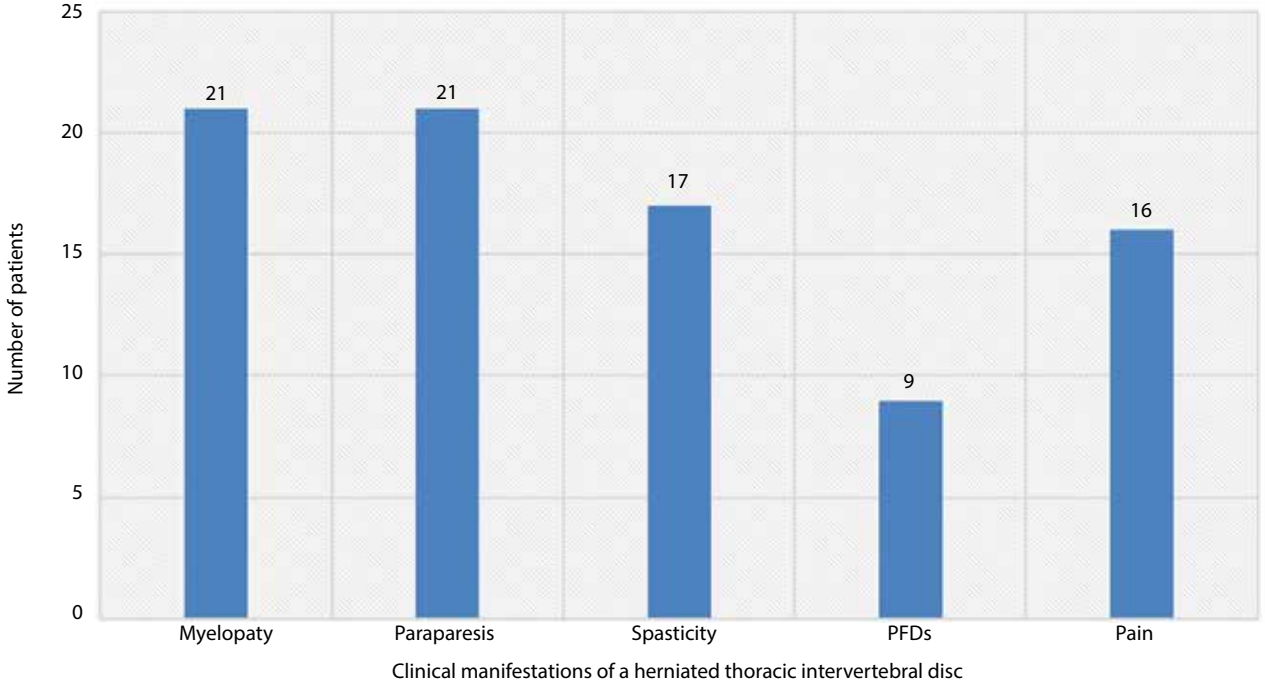

Fig. 3. *Clinical manifestations of Hernia of the thoracic intervertebral disc in patients at the time of hospitalization. Abbreviation: PFDs – violation of pelvic organ function*

Table 1. *Data on patients in groups with soft and ossified hernias of the thoracic intervertebral disc*

Patients data	Hernia of the thoracic intervertebral disc	
	soft	ossified
Age, years	61/59 (54; 64.8)*	49/48 (42; 57)*
Duration of the operation, min	203/205 (160; 242.5)	236/220 (177.5; 262.5)
Blood loss, ml	242/125 (50; 300)	746/700 (350; 1000)
Blood transfusion, abs./%	–	2/18
Duration of hospitalization, days	11.4/11 (8.5; 11.8)	11/10 (7.5; 13)
Time from symptom onset to surgery, years	1.7/1.0 (1; 2)	2.1/2.0 (1.0; 2.5)
Presence of degenerative lesions in other parts of the spine, abs./%	3/30	5/45
Follow-up, years	1.7/1.5 (1.0; 2.8)	3.1/3 (2; 4)

**Here and further in Tables 2–5, the values of the median/interquartile range are given (in parentheses – the minimum; maximum value of the sample).*

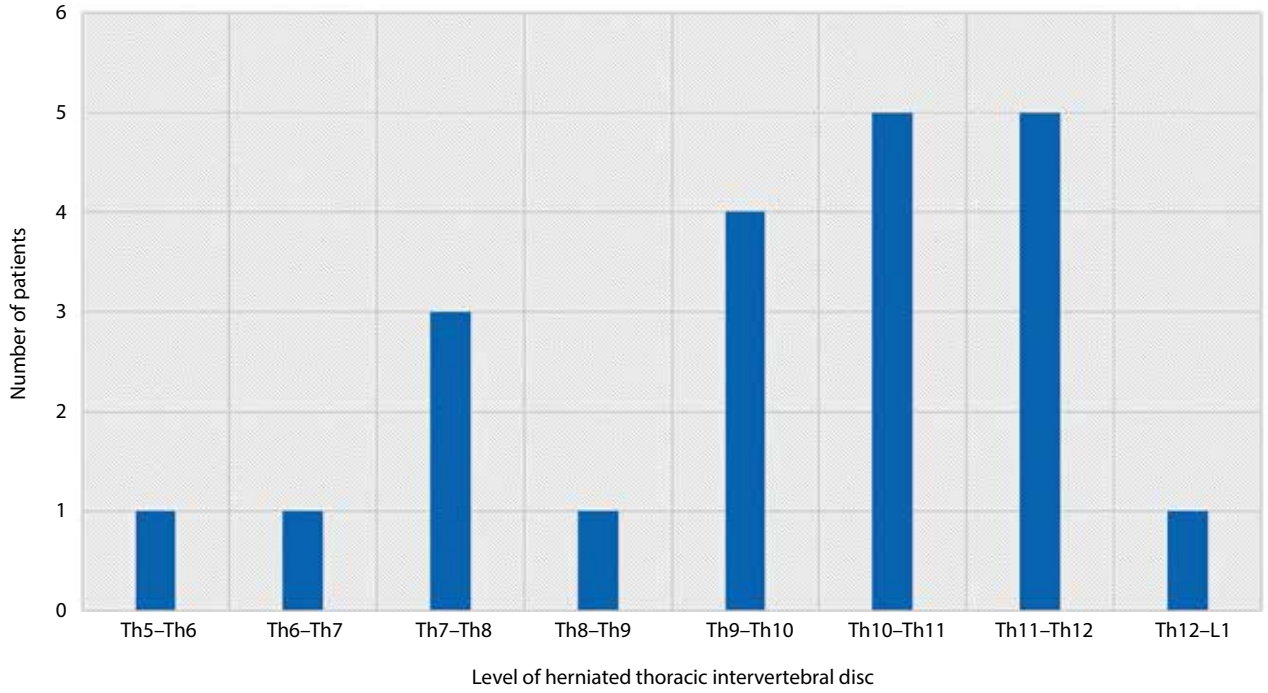

Fig. 4. *Distribution of patients according to the level of a herniated thoracic intervertebral disc*

pattern: the deterioration of neurological status of patients developed in the 1st days after the operation and then by the time of discharge a return to the initial state was noted. During the 1st days after surgery, there was a slight decrease in values of mJOA scale to 13/14 (12; 15) and at time of discharge – a return to the preoperative state to 13.3/14 (12; 15) (Table 3, Fig. 5).

We obtained similar results in the EMS assessment: in the early postoperative period there was a deterioration to 14/15 (12; 16) followed by a recovery of indicators to values of 14.2/15 (13; 16) by the time when the patient was discharged from hospital (Fig. 6, see Table 3)

Complications in the early postoperative period

Complications occurred in 7 (33.3 %) patients in the early postoperative period. Two (9.5 %) patients developed hydrothorax, 1 (4.8 %) – tense pneumothorax, 3 (14.2 %) – acute infection of the lower urinary tract, 1 (4.8 %) – thrombosis of the veins of the lower extremities.

Postoperative deterioration of neurological status occurred in 1 (4.8 %) patient with ossified median hernia at the level of Th10 – Th11 intervertebral disc. The preoperative neurological status of the patient corresponded to moderate severity (13 scores of mJOA and 15 scores of EMS). Intraoperatively, the blood loss in this patient was

Table 2. *Data on the clinical condition of patients in groups with soft and ossified hernias before the operation*

Methods for assessing the clinical condition of patients	Hernia of the thoracic intervertebral disc		Value *p*
	soft	ossified	
mJOA scale, points	12.3/12.5 (10.2; 14)	14.4/15 (13.5; 15)	0.030
EMS, points	13.5/13.5 (12; 15)	15.2/15 (15; 16)	0.047
Ashworth scale, points	1.7/2 (1.2; 2)	1.2/1 (1; 2)	0.180
Nurick scale, points	3.4/4 (2.2; 4)	2.2/2 (2; 2)	0.007
Pelvic floor dysfunction, number of patients	6	3	0.198

Abbreviations *(here and in Tables 3–5): mJOA (modified Japanese Orthopedic Association Score) – modified scale of the Japanese Orthopedic Association; EMS (European myelopathy score) – European scale of myelopathy.*

Table 3. *Evaluation of the results of treatment in different periods of observation*

Methods for assessing the clinical condition of patients	Before surgery	After the operation on the 1st day	Upon discharge from the hospital	At the follow-up
mJOA scale, points	13.4/14 (13; 15)	13/14 (12; 15)	13.3/14 (12; 15)	12.9/13 (11; 15)
EMS, points	14.4/15 (13; 16)	14/15 (12; 16)	14.2/15 (13; 16)	13.9/14 (12; 16)
Ashworth scale, points	1.4/2 (1; 2)	1.4/2 (1; 2)	1.2/1 (1; 2)	1/1 (0; 1)
Nurick scale, points	2.8/2 (2; 4)	3.1/3 (2; 4)	3/2 (2; 4)	3.1/3 (2; 4)

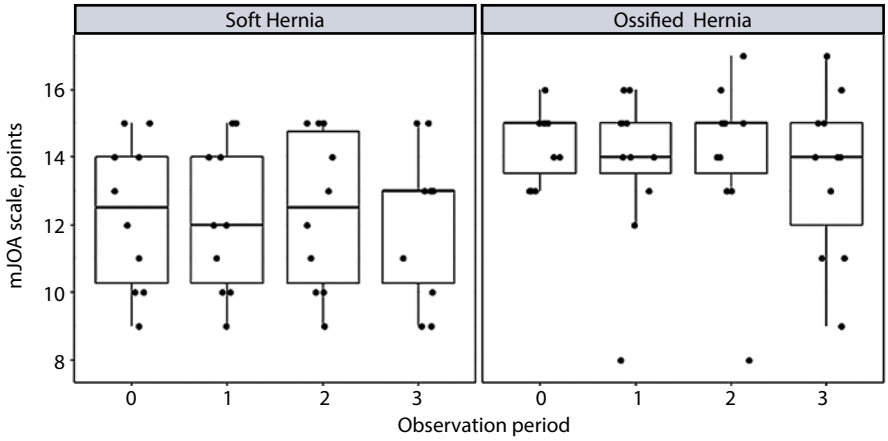

Fig. 5. *Dynamics of myelopathy manifestations in patients according to the modified scale of the Japanese Orthopedic Association (mJOA). Observation periods: 0 – before surgery; 1 – on the 1st day after the operation; 2 – upon discharge from the hospital; 3 – at the control examination*

1000 ml, and an unintentional durotomy occurred during the operation which required the installation of lumbar drainage. On the 1st day after surgery, the patient had increase in lower paraparesis to 2 scores (8 scores of mJOA and 11 scores of EMS). According to results of control examinations, positive dynamics was noted but by the present time (the period of catamnesis is 12 months), the neurological deficit has not recovered to its initial status and amounted to 9 scores of mJOA and 12 scores of EMS.

At the time of discharge, 18 (85.7 %) patients had no deterioration in the neurological status as compared to the preoperative one and 2 (9.5 %) patients had positive dynamics seen as decrease in degree of hypertension and degree of lower paraparesis. The condition of all patients at the time of discharge did not change significantly and corresponded the Frankel scale grade B in 2 (9.6 %) patients, grade C in 5 (23.8 %) and grade D in 14 (66.6 %) (Fig. 7).

Clinical evolution in the late postoperative period

When examining patients in the catamnesis, a statistically significant improvement in their condition was noted seem as decrease in degree of spasticity in the limbs according the Ashworth scale ($p < 0.05$): at baseline the score

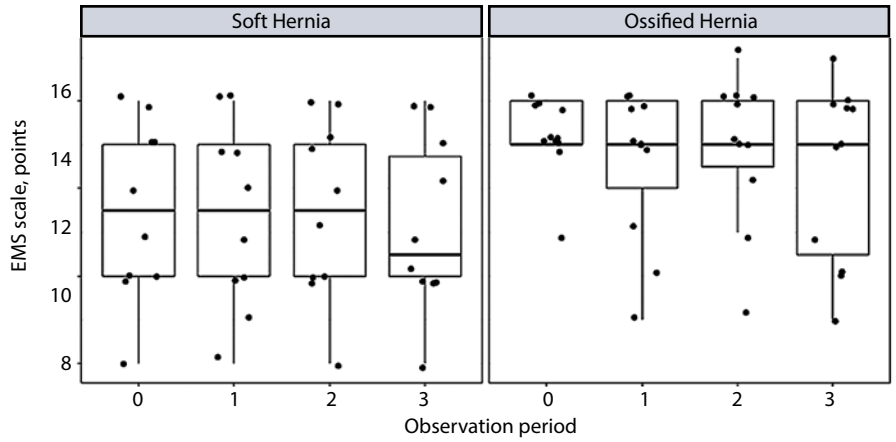

Fig. 6. *Dynamics of myelopathy manifestations in patients according to the European Myelopathic Scale (EMS). Follow-up period: 0 – before surgery; 1 – on the 1st day after the operation; 2 – upon discharge from the hospital; 3 – at the control examination*

Table 4. *Dynamics of neurological status indicators in a group of patients with soft hernias of the thoracic intervertebral disc*

Methods for assessing the clinical condition of patients	Before surgery	After the operation on the 1st day	Upon discharge from the hospital	At the follow-up
mJOA scale, points	12.3/12.5 (10.2; 14)	12.2/12 (10.2; 14)	12.4/12.5 (10.2; 14.8)	12.1/13 (10.2; 13)
EMS, points	13.5/13.5 (12; 15)	13.4/13.5 (12; 15)	13.5/13.5 (12; 15)	13.2/12.5 (12; 14.8)
Ashworth scale, points	1.7/2 (1.2; 2)	1.7/2 (1.2; 2)	1.4/1.5 (1; 2)	1.1/1 (1; 1.8)
Nurick scale, points	3.4/4 (2.2; 4)	3.4/4 (2.2; 4)	3.4/4 (2.2; 4)	3.5/4 (3; 4)
Pelvic floor dysfunction, number of patients	6	6	6	5

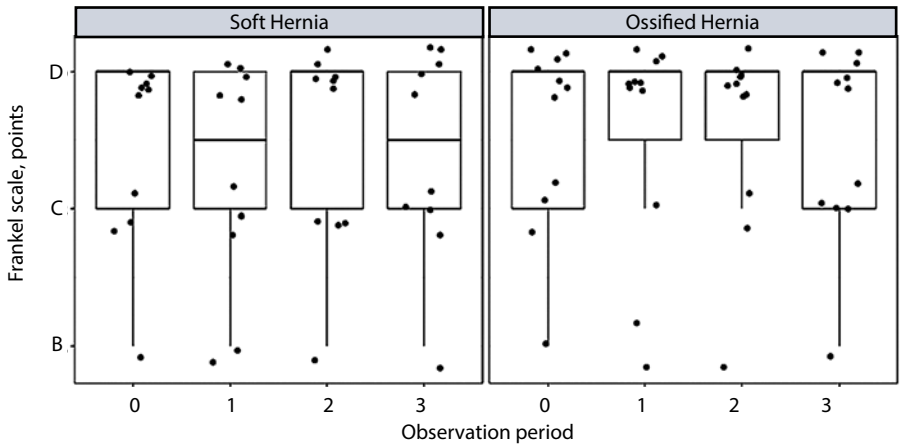

Fig. 7. *Dynamics of neurological status in patients according to the Frankel scale. Follow-up period: 0 – before surgery; 1 – on the 1st day after the operation; 2 – upon discharge from the hospital; 3 – at the control examination*

values were 1.4/2 (1; 2) during the follow-up period the patients reached the values of 1/1 (0; 1) (Fig. 8).

At the last available observation, the total score of mJOA scale decreased to 12.9/13 (11; 15) (see Fig. 5), by the EMS scale – to 13.9/14 (12; 16). In 7 (33.3 %) patients, there was a gradual decrease in mJOA and EMS scores in the late postoperative period, in 5 patients – a relatively moderate decrease in the scores (in 3 patients by 1 score and in 2 patients by 2 scores, respectively). In 2 patients, there was a marked decrease in the mJOA and EMS scores by 4 scores as compared to the preoperative level (Tables 3, 4, 5).

According to the results of the functional status assessment on the Nurick scale, there was no significant change in the scores in the late postoperative period (see Tables 3–5 and Fig. 9).

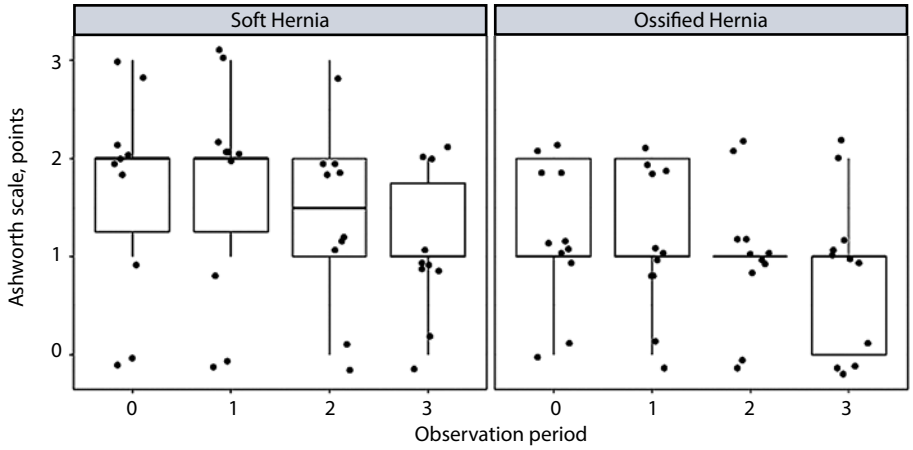

Fig. 8. *Dynamics of spasticity indicators in patients according to the Ashworth scale. Follow-up period: 0 – before surgery; 1 – on the 1st day after the operation; 2 – upon discharge from the hospital; 3 – at the control examination*

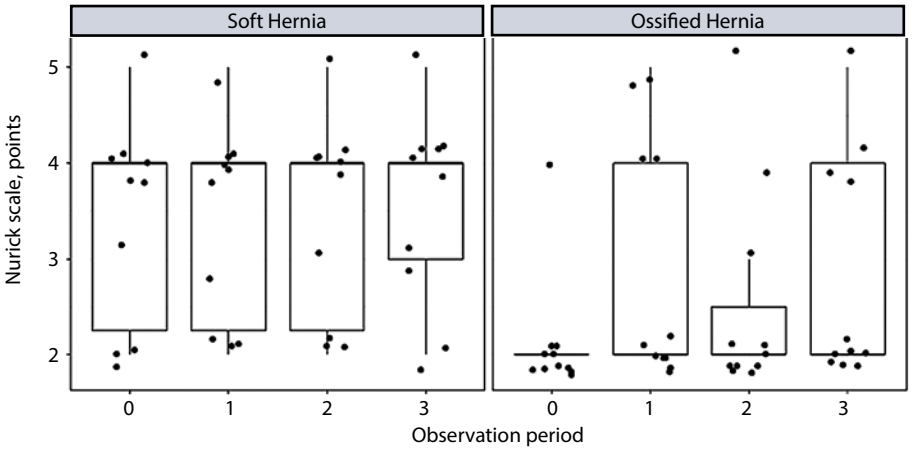

Fig. 9. *Dynamics of movement disorders in patients according to the Nurick scale. Follow-up period: 0 – before surgery; 1 – on the 1st day after the operation; 2 – upon discharge from the hospital; 3 – at the control examination*

Table 5. *Dynamics of neurological status indicators in a group of patients with ossified herniated thoracic intervertebral disc*

Methods for assessing the clinical condition of patients	Before surgery	After the operation on the 1st day	Upon discharge from the hospital	At the follow-up
mJOA scale, points	14.4/15 (13.5; 15)	13.8/14 (13.5; 15)	14.1/15 (13.5; 15)	13.5/14 (12; 15)
EMS, points	15.2/15 (15; 16)	14.5/15 (14; 16)	14.9/15 (14.5; 16)	14.5/15 (12.5; 16)
Ashworth scale, points	1.2/1 (1; 2)	1.2/1 (1; 2)	1/1 (1; 1)	0.8/1 (0; 1)
Nurick scale, points	2.2/2 (2; 2)	2.9/2 (2; 4)	2.5/2 (2; 2.5)	2.8/2 (2; 4)
Pelvic floor dysfunction, number of patients	3	3	3	4

The analysis has revealed deterioration of clinical results in patients who had concomitant spinal pathology (Fig. 10). It is worth emphasizing that according to the neurological examination data taken before operation, the leading role in development of the clinical evolution was played by HTD but not by the concomitant disease.

In the late follow – up period, the neurological status remained at the preoperative level in 10 (47.6 %) patients, and positive dynamics was observed in 4 (19.1 %) patients. Thus, a satisfactory result of surgical treatment was achieved in 14 (66.7 %) patients (see Tables 3–5).

DISCUSSION

The development of thoracic myelopathy in HTD is an indication for surgical intervention. Several surgical methods of decompression of the thoracic spinal cord have been described. The 1st and most widely used access is the classical posterior access, including laminectomy and microsurgical

discectomy [10]. Since with this access there is a high risk of damage to both the DM and the spinal cord, the posterior surgery of HTD is not considered as the «gold» standard of surgical treatment. In addition, there is a lateral approach, which is a retropleural bone transversectomy [11]. This access provides a larger view as compared with posterior surgery, but due to its traumatic nature it is not currently in use. In the article, we paid attention to the VATS method because it is most commonly used in our clinic for discectomy in patients with HTD. It is worth mentioning that the choice of surgical approach is influenced by both location of the herniated disc (central or lateral), expected nature of the hernia (ossified or mild) and the severity of clinical symptoms and patient tolerance to surgery [10].

The main subject of our study is the thoracic myelopathy. All of our patients had manifestations of thoracic myelopathy, in 17 (81 %) patients these symptoms were the 1st manifestation of the disease. In our study, the most common neurological symptom was lower paraparesis, pelvic organ dysfunction occurred in 42.9 % of patients. In the study of U. Quint et al., 60 % of patients had neurological deficit, 37 % had motor deficit that was 1st observed 1.5 years before surgery [5]. In our study, the time from the symptoms onset to surgical treatment was 1.9 years.

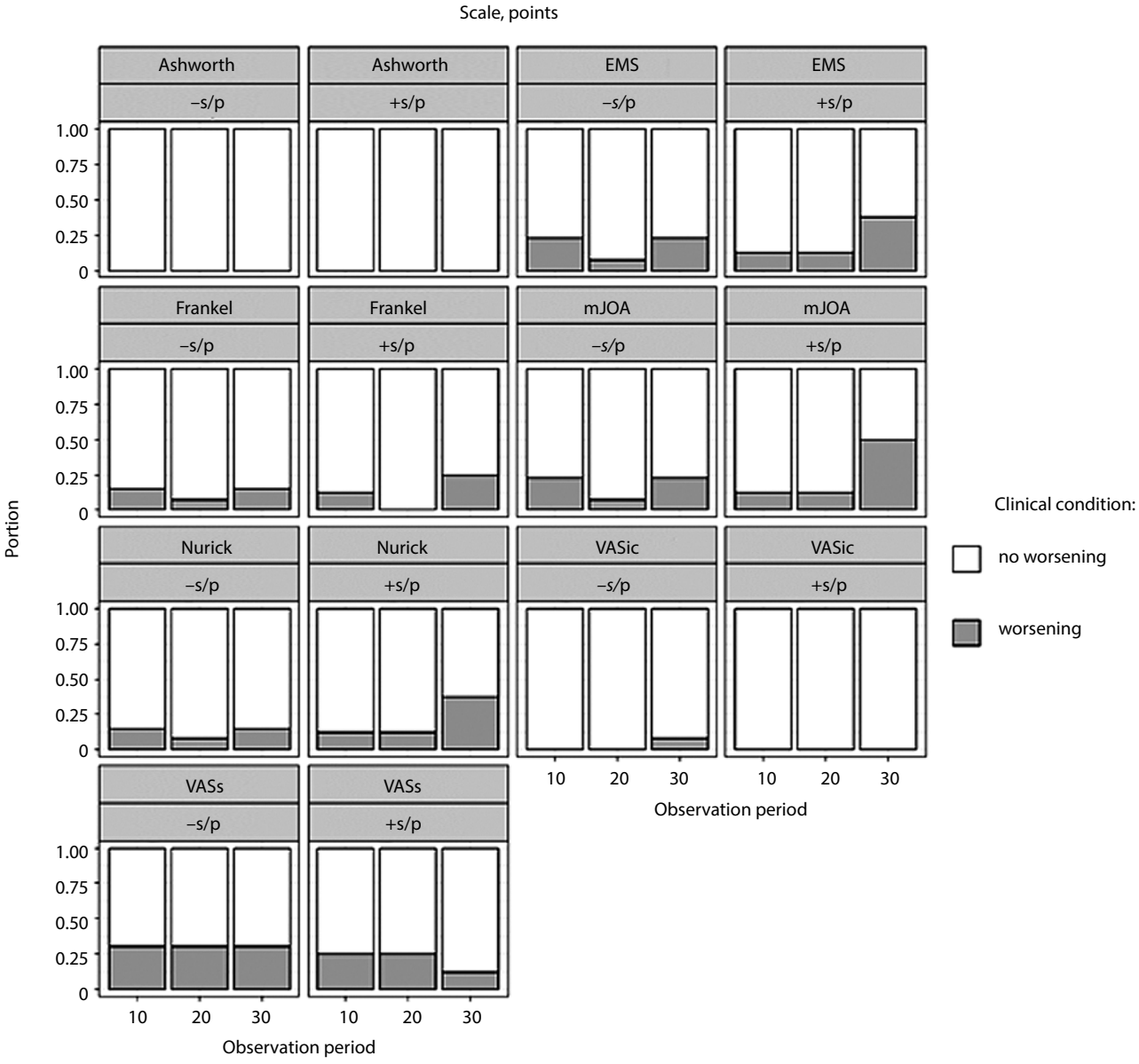

Fig. 10. *Dynamics of indicators of the studied scales in patients divided into groups with and without concomitant spinal pathology: s/p – spinal pathology at a different level; "–/+" – absence/presence. Observation periods: 10 – on the 1st day after the operation compared with the preoperative period; 20 – at discharge from the hospital; 30 – at the follow-up examination. VASic – visual analog scale of pain in patients in the intercostal space; VASs – visual analog scale for back pain*

It is worth mentioning that the clinical symptoms of HTD without surgical treatment are most often progressively aggravated and myelopathy develops as a result of compression-ischemic effect of hernial protrusion on the spinal cord. In the study of U. Quint et al., 89 % of patients had an increase in neurological deficit in dynamics during control examinations [5].

As a result of analysis of literature sources, A.E. Simonovich did not reveal the indisputable advantages of any of the surgical methods for HTD removal. According to different authors, each of the accesses has similar results of clinical outcomes [12].

Due to the availability of comparable results for each type of HTD surgery, endoscopic techniques have been increasingly developed. A.A. Grin et al. mention that advantages of VATS include low traumatic access, lower risk of development of postoperative pain syndrome and complications as compared with open interventions, as well as reduction in the period of hospitalization [13]. Definitely, in spite of these advantages, this technique also has obvious disadvantages. According to A.A. Grin et al., the main negative properties of VATS include difficulty of suturing the DM when it is broken, risk of uncontrolled bleeding, high cost of endoscopic equipment and absence of binocular field of view [13]. When using anterior approaches, which include videothoracoscopic discectomy, there is a high probability of development of serious pulmonary complications [12]. In our study, the frequency of clinically significant complications from the respiratory system was 14.3 %, which is comparable with the results of other studies.

In 1991, R.J. Lewis performed a videothoracoscopic discectomy for the first time, and in 1993 J.J. Regan et al. have reported effectiveness of this method in study involving 29 cases [14].

S. Ayhan et al. have reported results of VATS applied to group of 27 patients having manifestations of thoracic myelopathy, there were: improvements in level and severity of spinal cord injury according classification by American Spinal Injury Association (ASIA) in 44.4 % of patients, in 7.4 % of patients the condition worsened, and in 48 % did not change. It is worth noting that 11 out of 13 patients that did not demonstrate improvement in the preoperative period had an E degree according to the ASIA classification. In addition, in this work, the authors noted a clinical improvement according the Nurick scale – at the preoperative level the patients had 2.5 scores while and after surgery – up to 1.4 [6].

In our study, a large set of evaluation scales was used that allowed us to demonstrate stabilization or improvement of patient condition in early postoperative period in 85.7 % of cases. The results obtained suggest that transthoracic removal of HTD is an effective method for treating patients with this disease.

The results of studies related to this problem suggest that clinical evolution caused even by prolonged compression of the spinal cord by a herniated intervertebral disc at the thoracic level, may have positive dynamics in the long-term period after HTD surgery. According to the work of U. Quint et al., the clinical results obtained after a year seem to be final and after this time the possibility of restoring nervous functions reaches its limit [5].

The short hospitalization time and unexpressed pain at the site of surgery combined with a good clinical effect create high subjective satisfaction of patients after transthoracic discectomy. N. Anand et al. have received 83.8 % of good reviews from patients over 2 years of follow-up in the postoperative period [2]. U. Quint et al. have reported that 78 % of patients were satisfied with the result of interventions [5] and all patients had good and excellent clinical outcomes.

When choosing the type of intervention, an important aspect to be taken into consideration is the frequency of complications with transthoracic access. According to U. Quint et al., the complication rate was 15.6 % and was similar to the complication rate in HTD surgery performed from the posterior access [5]. N. Anand et al. [2] and R.J. Oskouian et al. [4] in their publications described a similar complication rate of videothoracoscopic microdiscectomy – 21 and 24 %, respectively.

In our publication, the frequency of all complications was 33.3 %, which is slightly higher than in similar studies, but only in 1 (4.8 %) case, the complication led to a significant deterioration in the patient's condition.

Taking into account our experience and the results reported in publications on this problem, the transthoracic removal of HTD seems to us to be an effective and safe method of treatment that allows to eliminate spinal canal stenosis and stabilize the clinical condition of patients.

CONCLUSION

According to our data, in patients with hernias at thoracic level of the spine accompanied by development of thoracic myelopathy, a stabilization or reduction of clinical manifestations of spinal cord injury after transthoracic treatment was observed in 85.7 % of cases. In this regard, the anterior transthoracic endoscopic access for removal of HTD appears to be an effective and fairly safe method of surgical treatment of spondylogenic thoracic myelopathy.

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