

THE ADVANTAGES OF DIFFERENTIATED TACTICS OF VIDEOTHORACOSCOPY IN PATIENTS WITH PLEURAL EFFUSION SYNDROME

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Abstract

The standard procedure of videothoroscopic intervention has a series of disadvantages, connected with intubation narcosis, that limit the contingent of patients, who can undergo it.

Aim of the work is to raise the efficacy of diagnostic videothoracoscopy at pleural effusion syndrome on the base of its differentiated tactics.

Materials and methods. Differentiated tactics of the choice of method of diagnostic videothoracoscopy in patients with pleural effusion syndrome was introduced in the work of thoracic surgery department. Its essence is in fact that before operation after evacuation of effusion from the pleural cavity there was created an artificial pneumothorax, the state of hemithorax was radiologically assessed. According to the results of radiological examination, the patients, who underwent videothoracoscopy in simplified way, were selected. As opposite to the standard method, at simplified way the intravenous sedation was used instead of endotracheal, muscle relaxants were not used, the additional surgical manipulations were not carried out. For assessment of the efficacy of this tactics 124 cases of diagnostics and treatment of pleural effusion syndrome using videothoracoscopy we analyzed.

Results. In the result of introduction of differentiated tactics of videothoroscopic diagnostic in patients with pleural effusion syndrome the number of postanesthetic side effects was reduced by 65,9 %, the frequency of anesthesia by narcotic analgetics – from

2,8 to 1,4 times/day, the term of recovery of independent stool – from 72,0 to 34,3 hours, the term of activation after surgery (independent movement) – from 23,8 to 10,3 hours, the duration of staying in the intensive care department was reduced from 24,8 to 9,7 hours, duration of postsurgical treatment was reduced from 16,0 to 10,1 days.

Results. The main advantages of introduction of differentiated tactics of videothoroscopic diagnostics were: the reliable acceleration of activation after surgery, recovery of adequate peristalsis and independent stool, decrease of duration of staying in the intensive care department, decrease of the necessity in anesthesia with narcotic analgetics, reduction of the number of postanesthetic side effects and mean duration of postsurgical treatment. The received result is connected with the fact that two thirds of patients did not undergo the effect of preparations for intubation narcosis.

Keywords: videothoracoscopy, pleural effusion syndrome, artificial pneumothorax, intravenous sedation, intubation narcosis, postanesthetic side effects, early postsurgical activation.

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1. Introduction

The pleural effusion syndrome it is a group of diseases of different etiology [1–3]. For revelation of the cause of pleurisy the morphological verification is necessary – the punctures of pleural cavity and different methods of biopsy of pleura [4–6]. Diagnostic videothoracoscopy corresponds to the criteria of the modern probative medicine more than other methods of etiological diagnostics of pleural effusion syndrome [7–9]. It allows carry out not only morphological verification of the pleura biopsy material. At infectious diseases, for example, at tuberculosis, videothoracoscopy gives a possibility to carry out microbiological study of the pleura. At oncologic pathology – immunohistochemical study of the tumor tissues [10–13].

The standard procedure of videothoroscopic intervention provides endotracheal narcosis, use of muscle relaxants, setting of thoracoports, creation of conditions for the full-blown visualization, namely the pleura biopsy and draining of the pleural cavity. This operation is usually realized without the special preoperative preparation [14–17].

It is known from the literary sources, that videothoracoscopy was introduced in the general medical practice 20–30 years ago, and optic thoracoscopy (that was named pleuroscopy, medical thoracoscopy in several countries) is used for more than 150 years (Fig. 1, 2) [18, 19].

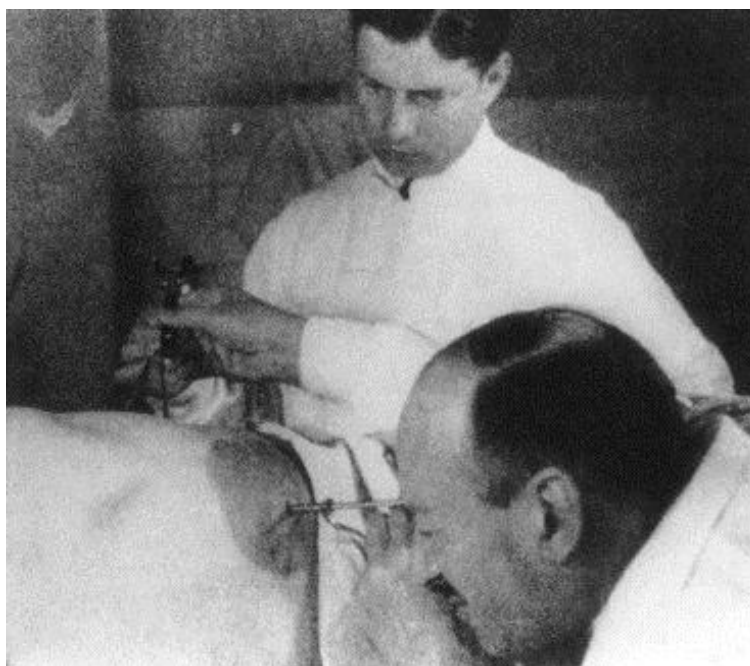


Fig. 1. Photo of the first thoracoscopic studies in medical practice

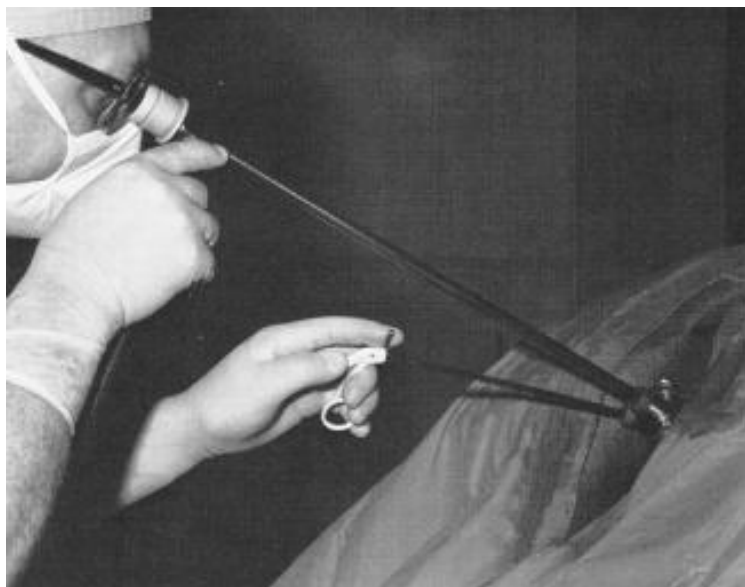


Fig. 2. Photo of introduction of optic thoracoscopy method in medical practice

The aforesaid procedure of this diagnostic operation is not a single possible one. For supporting of the optic thoracoscopy, the local anesthesia was used and also its combination with intravenous sedation. It became a base for statement of question – is the standard procedure obligatory for diagnostic thoracoscopy. In the case of refusal of it patient could avoid many side effects of intubation period. Alongside with it at the standard method of videothoracoscopy we sometimes observed the unfavorable conditions in the pleural cavity, connected with commissural process, union of the pleural leaves and encapsulation of pleural exudate [18]. Relative to the pleural cavity state we could oriented only by indirect signs and finally – after setting of the first thoracopore only [6, 8, 19, 20].

Having experience of the use of artificial pneumothorax for the treatment of pulmonary tuberculosis and before carrying out of the optic thoracoscopy, we set the task – to assess and characterize the further radiologic image of the pleural cavity state using artificial pneumothorax. Thus, we received a possibility of more detailed planning of the process of thoracoscopic intervention that allowed us to reduce the risk of intraoperative complications. Besides the diagnostic function, artificial pneumothorax helped to adapt the organs of pleural cavity to the future operation and separate the pleural leaves softly in accessible places. The essence of differentiated technique was to divide all patients in ones, who can undergo diagnostic videothoracoscopy by simplified method and ones, who need the traditional way of its execution.

2. Aim of research

To raise the efficacy of diagnostic videothoracoscopy at pleural effusion syndrome on the base of its differentiated tactics.

3. Materials and methods

We elaborated the differentiated tactics of videothoracoscopic diagnostics on the base of using the artificial pneumothorax and further radiological assessment of hemithorax state. As it is known, the standard technique provides evacuation of the pleural effusion and execution of videothoracoscopy. Differentiated tactics is in evacuation of effusion, creation of artificial pneumothorax, radiological assessment of hemithorax state and the choice of the variant of carrying out operation (standard of simplified way of videothoracoscopy). The question about the place of the first thoracoscopic access was also considered.

Simplified method differed from the standard one by the use of intravenous sedation instead of endotracheal intubation and the use of muscle relaxants, by the absence of additional surgical manipulation, significantly less time of operation itself and, correspondingly, the time of narcosis.

The main criterion at determination of surgical tactics was radiological one. In cases, when the air pushed the lung aside from the breast wall on all extent and the pleural cavity was absolutely free from commissures (**Fig. 3**) or if the weakly expressed commissural process did not impede the free manipulations in the pleural cavity, the simplified method was applied. Endophoto of such pleural cavity is demonstrated on the **Fig. 4**. But if at creation of artificial pneumothorax, the induction of air in the pleural cavity was impeded and the expressed obliteration of the oral cavity was observed at radioscopy or the numerous commissures were visualized (**Fig. 5**), the standard method of diagnostic videothoracoscopy was used. Endophoto of complicated pleural cavity is demonstrated on the **Fig. 6**. Endothacheal anesthesia gave a possibility to realize the additional medical procedures for improvement of visualization of the pleural cavity organs, adequate draining and creation of conditions for re-expansion of the lung.



Fig. 3. Radiography after creation of artificial pneumothorax.
Example of the free pleural cavity (Patient V.)



Fig. 4. Endophoto of hemithorax at diagnostic videothoracoscopy.
Example of the free pleural cavity (Patient V.)

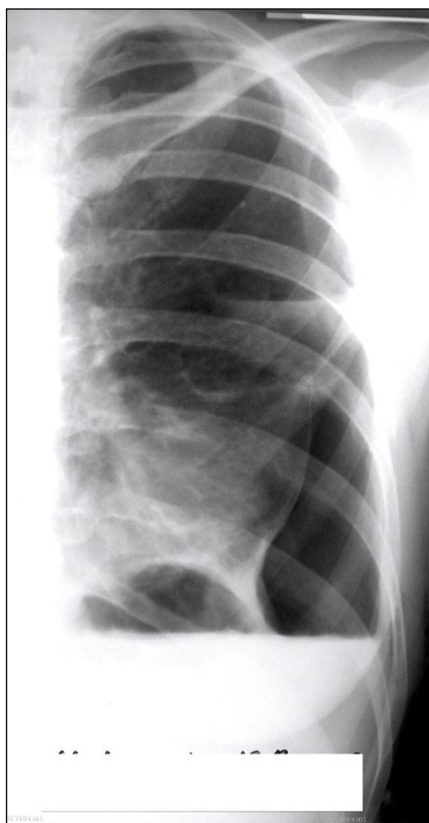


Fig. 5. Radiography after creation of artificial pneumothorax.
Example of obliterated pleural cavity (Patient C.)



Fig. 6. Endophoto of hemithorax at diagnostic videothoracoscopy.
Example of obliterated pleural cavity. (Patient C.)

This differentiated tactics of the choice of diagnostic videothoracoscopy method in patients with the pleural effusion syndrome was introduced in the work of the department of thoracic surgery SO “National institute of phthisiology and pulmonology named by F. G. Yanovsky, NAMS of Ukraine”. For assessment of this method there were analyzed 261 videothorascopies, carried out in our department during 2014–2015. There were 150 men and 110 women. The age diapason was 16–84 years. The first group included 168 patients, who underwent videothoracoscopy by the simplified way and 4 patients, who underwent operation under the local anesthesia. The second group included 89 patients, who were operated by the standard method according to elaborated criteria using the additional

endoscopic manipulations. The parameters of medicamental load, characteristics of the clinical course and the terms of postoperative treatment were selected as the assessment criteria. The results, received in groups, were compared between themselves and with the whole sampling. The results of the whole sampling (differentiated tactics) were compared with ones in the control group (62 patients, who underwent diagnostic videothoracoscopy without differentiated tactics).

The groups of patients were comparable by sex, age, somatic state, concomitant pathology and also by the structure of etiologic factors of pleurisy.

All patients underwent examinations using clinical, laboratory, radiological, instrumental and morphological methods of research. The main methods for revelation of the pleural emission syndrome were radiological ones. All patients underwent the obligatory radiography in two projections, polypositional, multiaxial radioscopy, at the necessity – computed tomography (93 patients).

In the case of revelation of pathological process in lungs and at complaints about cough, fiber-optic bronchoscopy was carried out (in 86 patients).

All patients underwent puncture and microdraining of the pleural cavity, where the effusion was observed. The punctate was obligatory studied in cytological, clinical (microscopy) and microbiological (inoculation on Lowenstein-Jensen medium and on the medium for revelation of nonspecific flora) laboratories.

In the result of aforesaid studies the etiology of disease was not established. For the morphological verification of diagnosis patients underwent videothoracoscopy.

4. Results of research

According to the results of introduction of differentiated tactics of videothoracoscopic diagnostic in the work of our department 65,9 % patients had the relatively free pleural cavity (**Fig. 7**). They underwent diagnostic videothoracoscopy by simplified method.

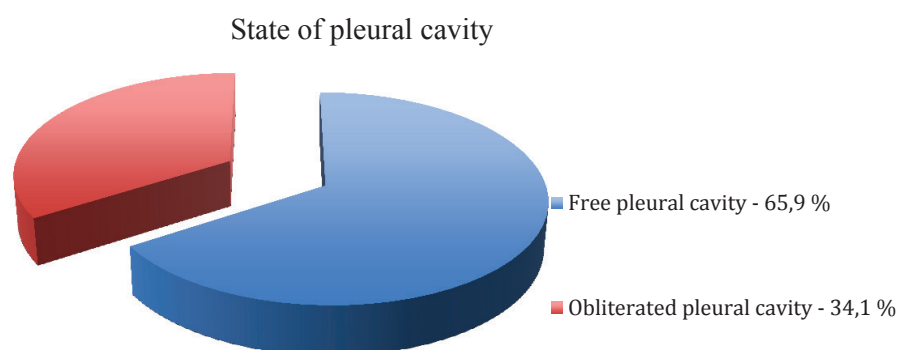


Fig. 7. Ratio of the pleural cavity state, free from unions and obliterated one

The structure of etiological factors of the pleural effusion syndrome is presented on the **Fig. 8**. According to our studies, nonspecific pleuritis are the main cause of the pleural effusion syndrome – 39,1 % of all patients. Tuberculous etiology was revealed in 33,3 % of patients. Oncologic pathology of pleura was verified in 15,3 % of patients. The other 12,3 % included the more rare causes such as: pleuritis at autoimmune diseases (sarcoidosis, Sjogren disease), cardiogenic hydrothoraxes, posttraumatic pleuritis, hepatic cirrhosis, lymphogranulomatosis and histiocytosis X.

The main results of research that have the great practical importance were the values of postoperative parameters. Among them: the frequency of postanesthetic side effects reduced from 100 % to 34,1 %, mean frequency of anesthesia with narcotic analgetics – from 2,8 to 1,4 times/day, mean term of activation after operation (independent movement) – from 23,8 to 10,3 hours, mean duration of staying in the intensive care department – from 24,8 to 9,7 hours, mean duration of postoperative treatment – from 16,0 to 10,1 days. The comparison of postoperative parameters of the different groups is presented in the **Table 1**.

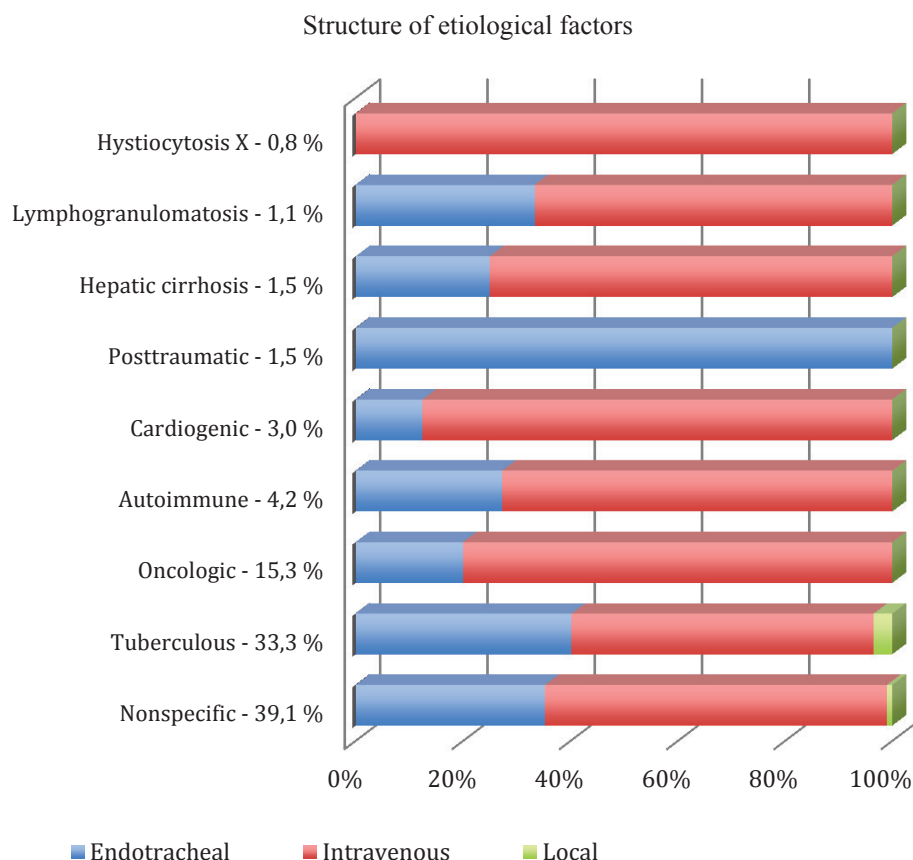


Fig. 8. Structure of etiological factors and anesthetic support of videothorascopies

Table 1

Mean values of postoperative parameters in patients, who underwent VTS by simplified and standard method

Parameter	Simplified method (n1=172)	Standard method (n2=89)	Differentiated tactics (n1+n2=261)	Standard tactics (n3=62)
Activation (independent movement), hours	4,1±0,1 [#]	22,3±0,2	10,3±0,5	23,8±0,1
Recovery of independent stool, hours	4,8±0,03 [#]	73,8±0,05	34,32±0,11	72,0±0,3
Term of staying in intensive care department, hours	2,60±0,05 [#]	23,30±0,15	9,66±0,61	24,8±0,1
Frequency of anesthesia with narcotic analgetics times/day	0,20±0,03 [#]	3,80±0,05	1,43±0,11	2,8±0,1
Number of patients with postanesthetic side effects reduced, abs. %	0/(0,0±2,2) [#]	89/(100,0±4,2) %	89(34,1±2,9) %	62/(100,0±4,2) %
Exudation volume for three first days, ml	251,2±4,8 [#]	485,6±8,1	331,1±8,1	855,2±14,3
Term of drainages elimination, days	4,2±0,1 [#]	8,6±0,1	5,7±0,1	6,7±0,1
Finish of stationary treatment, days	7,7±0,1 [#]	14,7±0,1	10,1±0,2	16,0±0,2

Note: # – Difference between the parameters of patients, who underwent the standard tactics and simplified method, is statistically significant ($p < 0,001$)

It was proved by the statistical methods, that such tactics was not associated with the increase of morphological diagnostics efficacy. The general efficacy of diagnostic videothoracoscopy was 99,2 %. We did not observe any complications at execution of aforesaid videothoracoscopic operations.

6. Discussion of results

The received results testified that introduction of differentiated tactics allowed reduce the frequency of post anesthetic side effects, decrease the mean frequency of anesthesia by narcotic analgetics and the mean term of activation after operation (independent movement), to reduce the mean duration of staying in the intensive care department and also the mean duration of postoperative treatment. It became possible due to the simplified method of videothoracoscopy and differentiated tactics that allowed select patients for such organization of diagnostics.

Having analyzed the results of research, we revealed that the standard procedure of videothoracoscopy was necessary only in 34,1 % of patients. That is almost two thirds of patients did not undergo intubation narcosis, they had not any side effects, connected with it, specially, in early postoperative period. Having underwent videothoracoscopy according to the offered simplified scheme, patients received significantly less medicamental load. So, this contingent avoided the significant portion of preparations, used at the side effects of anesthesia. We consider the whole aforesaid complex as a cause of essential improvement of the parameters of postoperative course after videothoracoscopic diagnostics in patients with the pleural effusion syndrome.

7. Conclusions

At etiological diagnostics of the syndrome of pleural effusion it is possible and enough to use the simplified method in most patients, which efficacy is not less than the standard one.

The use of artificial pneumothorax with further radiological assessment gives a possibility to select patients, who can undergo the diagnostic videothoracoscopy by simplified way.

Clinical-radiological criteria for the choice of the method of videothoracoscopy, plan of operation and the method of anesthesia provide the assessment of the degree of compression of lung, union of its separate parts with breast wall, determination of presence, number and localization of commissures and also physical data and subjective feelings of patients.

It was established, that the efficacy of simplified method of diagnostic videothoracoscopy did not statistically differ from the one at the standard method. The general efficacy of diagnostic videothoracoscopy is 99,2 %.

Due to the introduction of differentiated tactics of videothoracoscopic diagnostics in the clinical practice, the term of activation after operation reduced on the average more than in two times, the term of independent stool recovery – more than in two times, duration of staying in the intensive care department – in 2,5 times, the number of side postanesthetic effects – in 1,5 times. We did not observe any intraoperative complications, connected with setting of the first thoracoport.

References

- [1] Baumer, J. H. (2005). Parapneumonic effusion and empyema. Archives of Disease in Childhood – Education and Practice, 90 (1), ep21–ep24. doi: 10.1136/adc.2005.073478
- [2] Davies, H. E., Davies, R. J. O., Davies, C. W. H. (2010). Management of pleural infection in adults: British Thoracic Society pleural disease guideline 2010. Thorax, 65, ii41–ii53. doi: 10.1136/thx.2010.137000
- [3] Wrightson, J. M., Maskell, N. A. (2012). Pleural infection. Clinical Medicine, 12 (1), 82–86. doi: 10.7861/clinmedicine.12-1-82
- [4] Bhatnagar, R., Maskell, N. (2014). Pleural fluid biochemistry – old controversies, new directions. Annals of Clinical Biochemistry: An International Journal of Biochemistry and Laboratory Medicine, 51 (4), 421–423. doi: 10.1177/0004563214531236
- [5] Biswas, A., Bhattacharya, S. (2008). Diagnostic role of closed pleural biopsy in the investigation of exudative pleural effusions. J. Indian Med. Assoc, 106 (8), 525–526.
- [6] Brown, J., Ricketts, W., Bothamley, G. (2012). P118 Abrams-Needle Pleural Biopsy Remains a Useful Investigation in Suspected Pleural Tuberculosis. Thorax, 67, A113.2–A113. doi: 10.1136/thoraxjnl-2012-202678.401

- [7] Tsakiridis, K., Zarogoulidis, P. (2013). An interview between a pulmonologist and a thoracic surgeon – Pleuroscopy: the reappearance of an old definition. *Journal of Thoracic Disease*, 5, 449–451. doi: 10.3978/j.issn.2072-1439.2013.05.14
- [8] Dixon, G., Fonseka, D., Maskell, N. (2015). Pleural controversies: image guided biopsy vs. thoracoscopy for undiagnosed pleural effusions? *J. Thorac. Dis.*, 7 (6), 1041–1051. doi: 10.3978/j.issn.2072-1439.2015.01.36
- [9] Golden, M. P., Vikram, H. R. (2005). Endoscopic approach to pulmonary diseases: Clinical utility of medical thoracoscopy in diagnosis of pleural diseases. *American Family Physician*, 9 (72), 1761–1768.
- [10] Skachkov, A. M., Fedoseev, V. F., Sobinin, O. V. (2010). Thoracoscopy for exudative pleuritis. Abstracts of the XIV Congress of Russian society of endoscopic surgeons, 140–141.
- [11] Tuhtin, N. S., Stogova, N. A., Giller, D. B. (2010). *Pleura disorders*. Moscow: Medicine, 256.
- [12] Czarnecka, K., Yasufuku, K. (2012). Interventional pulmonology: Focus on pulmonary diagnostics. *Respirology*, 18 (1), 47–60. doi: 10.1111/j.1440-1843.2012.02211.x
- [13] Detterbeck, F. C. (2013). Thoracoscopy. *Clinics in Chest Medicine*, 34 (1), 93–98. doi: 10.1016/j.ccm.2012.12.002
- [14] Safonov, V. Je. (2008). Efficiency of using videothoroscopic operations in complex diagnosis and treatment for disorders of lung, pleura and mediastinum. State organization “National institute of phthisiology and pulmonology named by F. G. Yanovsky National academy of medical sciences of Ukraine”. Kyiv, 23.
- [15] Dhooria, S., Singh, N., Aggarwal, A. N., Gupta, D., Agarwal, R. (2013). A Randomized Trial Comparing the Diagnostic Yield of Rigid and Semirigid Thoracoscopy in Undiagnosed Pleural Effusions. *Respiratory Care*, 59 (5), 756–764. doi: 10.4187/respcare.02738
- [16] Akulian, J., Yarmus, L., Feller-Kopman, D. (2013). The Evaluation and Clinical Application of Pleural Physiology. *Clinics in Chest Medicine*, 34 (1), 11–19. doi: 10.1016/j.ccm.2012.11.001
- [17] DePew, Z. S., Wigle, D., Mullon, J. J., Nichols, F. C., Deschamps, C., Maldonado, F. (2014). Feasibility and Safety of Outpatient Medical Thoracoscopy at a Large Tertiary Medical Center. *Chest*, 146 (2), 398–405. doi: 10.1378/chest.13-2113
- [18] Loddenkemper, R., Mathur, P. N., Lee, P., Noppen, M. (2011). History and clinical use of thoracoscopy/pleuroscopy in respiratory medicine. *Breathe*, 8 (2), 144–155. doi: 10.1183/20734735.011711
- [19] Hooper, C. E., Welham, S. A., Maskell, N. A. (2014). Pleural procedures and patient safety: a national BTS audit of practice: Table 1. *Thorax*, 70 (2), 189–191. doi: 10.1136/thoraxjnl-2013-204812
- [20] Doelken, P. (2008). Clinical Implications of Unexpandable Lung Due to Pleural Disease. *The American Journal of the Medical Sciences*, 335 (1), 21–25. doi: 10.1097/maj.0b013e31815f1a44
- [21] Alar, T., Ozcelik, C. (2013). Single-incision thoroscopic surgery of pleural effusions for diagnosis and treatment. *Surgical Endoscopy*, 27 (11), 4333–4336. doi: 10.1007/s00464-013-3060-y