

To Prof. Dr. Poromanski

Chairman of the Scientific Jury,

Appointed by Order No. RD 26-683/03.04.24

of the Executive Director
of the University Hospital "N.I. Pirogov" EAD

STATEMENT

by Prof. Dimitar Temelkov Kostadinov, PhD.

**Head of the Bronchology Department at the University Hospital "St. Ivan
Rilski" EAD**

dissertation for the award of the educational and scientific degree "PhD"

professional field - 7.1. "Medicine"

scientific specialty - "Pediatric Surgery"

Author. D-r Nikola Kostadinov Kartulev

form of the doctoral studies: free doctoral student

Topic: 'Bronchoscopic obturation for persistent air-leak after video-assisted thoracoscopic abscessotomy in childhood'

Scientific supervisor: prof. dr. Hristo Ivanov Shivachev, PhD

1. General presentation of the procedure

Dr. Kartulev was enrolled as a doctoral student in a free form of training by Order № RD-26-1179/01.07.2012 with the Clinic of Pediatric Surgery at the University Hospital "N.I. Pirogov EAD and the topic "Bronchoscopic obturation in persistent air leak after video-assisted thoracoscopic abscessotomy in childhood". After completing the development of his dissertation for the Ph.D. degree, Dr. Kartulev was discharged with the right to defend it by Order No. RD-26-2402/19.12.2023.

Dr. Kartulev has submitted a set of materials on paper and electronic media, which are in accordance with the Law on the Development of Academic Staff in the Republic of Bulgaria, its Regulations and the Regulations for the Development of Academic Staff at the University

Hospital "N.I. Pirogov" EAD, including all the necessary competition materials specified in the Law.

I have found no deficiencies in the documentation submitted by Dr Nikola Kartulev for the present competition.

I do not have a conflict of interest within the meaning of Article 4(5)

2. Brief biographical data about the PhD student.

Dr. Nikola Kostadinov Kartulev was born on 08.12.1989 in Sofia. In 2014 he graduated from the Medical University of Sofia with a Master's degree in Medicine. Since 05.01.2015 he started his professional career as a resident physician at the University Hospital "N.I.Pirogov" in the Department of Pediatric Surgery. From 01.06.2015 he was enrolled as a trainee in Pediatric Surgery at the same clinic. Since 01.01.2021 he has been recognized as a specialist in pediatric surgery and continues to work as a pediatric surgeon at the Clinic of Pediatric Surgery, Department of Pediatric Thoracic Surgery.

Dr. Kartulev has held various trainings: Advanced Course Laparoscopic Neonatal Surgery, Naples, Italy /07.2016/; Fresh-up Laparoscopische chirurgie, Bochum, Germany /03.2017/; Endoscopy Summer School, Sheffield, United Kingdom /06.2022/.

Holds certificates for:

- Conventional gastrointestinal endoscopy from 2021.
- Interventional gastrointestinal endoscopy from 2022.
- Conventional fibrobronchoscopy from 2023.
- Interventional pulmonology from 2024.

3. Relevance of the topic and appropriateness of the goals and objectives.

In the early 20th century, thoracoscopic interventions were first used in children in North America by Rodgers et al. in 1979, and the first pediatric thoracoscopic lobectomy was reported by Rothenberg in 2000.

Video-assisted thoracic surgery (VATS) is being used with increasing frequency for a wide variety of indications in pediatric patients, from diagnostic biopsies to resections for malignancy and from the treatment of empyema to the treatment of persistent air leak (leaking air) in the postoperative period. The great advantages of thoracoscopy over thoracotomy have made its use increasingly widespread. Compared with thoracotomy, VATS is associated with less postoperative pain, less blood loss, faster recovery time, less hospitalization, and better cosmetic and functional outcomes. One of the most important benefits of VATS for the pediatric population is the prevention of musculoskeletal abnormalities that can occur with thoracotomy. Musculoskeletal abnormalities have been reported in up to 62% of children undergoing thoracotomy. Despite these advantages, thoracoscopic surgery requires an experienced team to perform the procedure successfully given the surgical technique and anesthetic procedures. VATS is a safe and effective treatment approach in the pediatric population when performed by an experienced surgical and anesthesia team.

The dissertation of Dr. Kartulev covers 128 pages, richly illustrated with 61 figures and 19 tables. The reference list includes 124 references, 73.4% of which are from the last 15 years.

4. Knowledge of the problem.

Air leak after pulmonary resection is almost always caused by an alveolar pleural fistula, which is defined as a communication between the lung parenchyma distal to the segmental bronchus and the pleural space or from a centrally located airway (broncho-pleural fistula).

Prolonged air leak (PAL) is the most common complication after lung resection due to a number of diseases, including lung abscess and necrotizing pneumonia.

Dr. Kartulev followed the introduction of video-assisted thoracoscopic surgery (VATS) as a routine intervention for children with parapneumonic pleural complications (PPC) or parapneumonic pleuro-pneumonic complication (PPPC) and the possibility of minimally invasive management for the purpose of comprehensive treatment with adequate pleural and/or abscess cavity drainages and eradication of persistent air leak with minimal trauma and maximal organ preservation and faster recovery in these patients.

The PhD student acknowledges the fact that, despite the successes achieved, a proportion of patients required resection surgery due to incomplete control of the inflammatory process and persistent air leak after VATS. On the other hand, the use of talc pleurodesis with pleural abrasion may not reduce the incidence of PAL after VATS surgery. Pleurodesis with talc with pleural abrasion should be used with caution in young patients.

This has necessitated a search for a new approach that would solve the problem of persistent air leak and be an alternative to lung resection. Since 2016, the Department of Pediatric Surgery has been searching for and developing methods to treat these patients, which is the subject of Dr. Kartulev's dissertation.

In the 35-page literature review, Dr. Kartulev traces the treatment methods for lung abscess, noting the first VATS in our country (2003) and in the world since 1970. A section is devoted to nonspecific inflammatory diseases of the lung and pleura with possible complications and treatment methods. In the case of underlying disease with PPC or PPPC, the minimally invasive treatment modalities applied do not fully resolve the issue of persistent air leak as unresolved and subject to further research.

5. Aim and objectives.

The aim of this dissertation is clearly stated: to develop and implement a comprehensive approach to persistent air leak after VATS abscessotomy in childhood.

The five tasks are a logical consequence of the correctly formulated aim and are of a concrete nature.

1. To evaluate the efficacy of minimally invasive bronchoscopic obturation with a synthetic blocker.
2. To determine the indications and to develop a diagnostic and therapeutic algorithm for the application of the method.
3. To evaluate early and late results.
4. To compare the results of the method with others used in practice.
5. To introduce the methodology as a routine procedure in practice.

6. Study material and methodology.

The study design included 120 patients up to 18 years of age with PPPC treated and followed up from 2015 to 2023 at the Department of Thoracic Surgery, Department of Pediatric Surgery, N.I. Pirogov University Hospital. Dr. Kartulev divided the young patients into three groups according to the course of the disease and the treatment methods used. Demographic distribution, clinical characteristics and imaging results were compared.

A wide range of diagnostic and therapeutic methods are applied. Especially bronchoscopic obturation was introduced in the pediatric surgery clinic in December 2016. The doctoral student used synthetic obturators or synthetic sponge in his work, and the obturators were previously modeled for the respective bronchus through which the fistula was found.

It should be noted that Dr. Kartulev handles equally well flexibular and rigid bronchoscopic techniques in the performance of the tasks. Different statistical methods were used (descriptive statistics, Kolmogorov-Smirnov test, Ho-squared test, non-parametric test), and the data were processed with the specialized statistical package SPSS (Statistical Package for the Social Sciences) version 20.0.

7. Results and Discussion

The results and comparative analysis by clinical parameters are presented on 45 pages, very well illustrated in 44 figures and 10 tables.

The first group of patients (A) included 57 patients aged up to 18 years with pulmonary abscess in whom a VATS abscessotomy was performed, air leak was found, but it stopped spontaneously within 48-72 hours. No further surgical or interventional manipulations were required in this group. Postoperatively, air leak ceased spontaneously in all patients in group A within 48-72 hours. The mean hospital stay was 13.1 days.

The second group of 10 patients (B) also presented with a lung abscess and underwent VATS abscessotomy, but subsequent thoracotomy with resection of the lung parenchyma due to persistent air leak. Of note in this group of patients was the illustrated loss of lung parenchyma (e.g., 30% of patients had a 50% loss) and the mean hospital stay of 24.4 days.

The third group consisted of 50 patients aged 18 years or younger with a lung abscess in whom a VATS abscessotomy was performed. Due to persistent air expiration, a subsequent bronchoscopic obturation was performed between days 1 and 12 of the manifested air expiration.

Complete cessation of air-liquids was achieved in 47 children (94%). In 3 children (6%), a subsequent thoracotomy with resection of the affected lung parenchyma was required - due to persistence of air leak after obturation. In none of the children in this group did the loss of lung parenchyma exceed 10%. Repeat bronchoscopy due to obturator migration or expectoration was performed in 14 children (28%). The mean hospital stay was 18.74 days.

Outside of the three groups of patients presented, Dr. Kartulev performed bronchoscopic obturation in 3 children with pulmonary abscess and minimal pleural reaction and 1 child with persistent air leak due to traumatic lung injury. These patients were not included in the comparative outcome analysis because of their small numbers and different disease course. Their results are presented separately from the other patients and illustrate the broader application of the methodology.

The shortest hospital stay was found in the first group of patients. In the other two groups, as the spontaneous air leak was not stopped, subsequent surgical or interventional treatment was required.

The aim of this thesis to compare the outcomes of patients in groups B and C who have prolonged air leak after VATS-abscessotomy has been fulfilled. Preservation of lung parenchyma and absence of postoperative pain symptomatology is an advantage for the small group B patients. Anesthesia in this group of patients is brief (15-30 min) and no ICU or monitoring is required after the interventional procedure.

The reduced hospital stay for patients in groups B and C compared with those in group A (mean 4.9 days) was not insignificant.

On the basis of all the results achieved, Dr. Kartulev built a comprehensive algorithm for the management and follow-up of young patients with persistent expiratory airflow, which is also applicable to adults for the treatment of PPC.

8. Conclusions

On the basis of the results, Dr. Kartulev draws 9 conclusions fully covering the requirement in the five tasks.

9. Contributions and significance of the development for science and practice.

The contributions of Dr. Kartulev's work (four of a scientific and one of an applied nature) are well formulated, and one original scientific basis can be assumed - for the first time in Bulgaria the routine performance of the manipulation of bronchoscopic obturation of patients up to 18 years of age as a routine procedure in their treatment with persistent air leaks is reported.

10. Assessment of the dissertation publications and the doctoral student's personal involvement.

The PhD student has attached a list of 36 scientific publications and participation in scientific forums with posters and papers. Of these, 9 are listed in the table for fulfilling the scientific-metric criteria in the procedure for awarding the PhD degree in the scientific specialty "Pediatric Surgery" of group D - 39.76 points, 4 are directly related to the dissertation (one with an impact factor of 2.9).

11. Abstract

The abstract is formatted according to the requirements of the relevant regulations and reflects the main results achieved in the thesis. It is written on 93 pages and illustrated with 61 figures and 19 tables. It is structured correctly and reflects the essence of the thesis.

12. Critical comments and recommendations:

- there are places in the dissertation with spelling mistakes, which I consider a technical error;

- the doctoral student believes that "the placement of bronchoscopic valves requires the use of a bronchoscope with a large working channel diameter, which is impractical in the young age group due to the smaller size of the bronchi (the majority of patients are children under 6 years of age)". Obturator placement regardless of bronchus size and patient age can be performed regardless of working channel size, especially if working with an I-gel mask;

- I would recommend Dr. Kartulev to use the Bulgarian equivalent of the word leakage - air leak/air escape;

- The order of authors cited in the reference list is not in the generally accepted way: first in Cyrillic and then in Latin or in the order of citation in the thesis;

- In the literature review I do not find cited the publications of Rodgers BM, Moazam F, Talbert JL. Thoracoscopy in children. *Ann Surg.* 1979;189:176-180. doi: 10.1097/00000658-197902000-00008. [PMC free article] [PubMed] [CrossRef] [Google Scholar] and Rothenberg SS. Thoracoscopic lung resection in children. *J Pediatr Surg.* 2000;35:271-275. doi: 10.1016/s0022-3468(00)90023-x. [PubMed] [CrossRef] [Google Scholar]. Rodgers BM was the first to introduce thoracoscopy in children, and the second to perform the first thoracoscopic lobectomy in children. I think it is always appropriate to cite the first to introduce a major method used in the dissertation.

These remarks do not change the substance and significance of the thesis.

13. CONCLUSION

The dissertation work of Dr. Nikola Kostadinov Kartulev addresses a topical problem and contains original, scientific and applied contributions. It is presented in a comprehensible way

and is read without difficulties. Very well illustrated. The style is concise, without unnecessary repetitions or citations, and the bibliography has sufficient data on the cited publications. There is a logical and meaningful connection between the different parts of the dissertation.

Dr. Kartulev's work shows that the PhD student has sufficient theoretical knowledge and professional skills in the scientific specialty of "Pediatric Surgery", demonstrating the qualities and skills for independent scientific research.

The thesis meets all the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria (LADRB), the Regulations for the Implementation of the LADRB and the Regulations for the Development of Academic Staff at the University Hospital "N.I. Pirogov EAD,

Due to the above, I confidently give my positive assessment of the dissertation submitted for peer review with achieved results and contributions, abstract, scientific publications and recommend the members of the esteemed scientific jury to award the educational and scientific degree "Doctor" to Dr. Nikola Kostadinov Kartulev in the doctoral program in "Pediatric Surgery".

24.05.2024 г.

Prof. Dr. D. Kostadinov, PhD: