DIAGNOSTIC ACCURACY OF BRONCHIAL BRUSHING CYTOLOGY AND IMPRINT CYTOLOGY FOR DIAGNOSIS OF LUNG CANCER USING FLEXIBLE BRONCHOSCOPY

IVICA RAGUŽ[1], VIOLETA ŠOLJIĆ[1,2,3], JOSIP MIŠKOVIĆ[4], TANJA ZOVKO[5], ANITA KOLOBARIĆ[3], KATARINA VUKOJEVIĆ[2,3,6]

[1]Clinical Department of Pathology, Cytology, and Forensic Medicine, University Hospital Mostar, Mostar, Bosnia and Herzegovina [2]Faculty of Health Studies, University of Mostar, Bosnia and Herzegovina [3]School of Medicine, University of Mostar, Department of Histology and Embryology, Bosnia and Herzegovina [4]Clinical Department of Surgery, University Hospital Mostar, Mostar, Bosnia and Herzegovina [5]Department of Pulmonology, University Hospital Mostar, Mostar, Bosnia and Herzegovina [6]University of Split School of Medicine, Center for Translational Research in Biomedicine

ABSTRACT

Objective: The goal of our study was to assess the sensitivity and specificity as well as the positive and negative predictive value of bronchial brushing cytology (BBC) and imprint cytology, and their usefulness in the diagnosis of lung cancer using flexible bronchoscopy. *Materials and methods:* This study was conducted at the Department of Pathology, Cytology, and Forensic Medicine of the University Hospital Mostar. Data were collected from the archives for the period from January 2016 to December 2020. Data for 1936 patients were retrieved. A selection of 508 patients who had a histopathological and/or cytological confirmation of lung cancer were included in this study. Samples were obtained by flexible fiberoptic bronchoscopy. Brushing specimens were obtained with a sterile, single-use brush that was enclosed within a catheter sheath, and after that bronchial washing was performed. Tissue sampling techniques were performed using forceps endobronchial and transbronchial biopsies. The cytology and histopathology slides were viewed independently by three clinical cytologists and pathologists. *Results:* Using histopathological findings for lung cancer diagnosis we have found a significant degree of concordance between cytology and pathology ($\kappa = 0.135$; $P < 0.001$). However, 107 patients were cytologically positive for lung cancer while being pathologically negative. Upon further investigation into their medical histories we found the following results: in 69 patients, lung cancer had already been suspected by some other method (radiological/CT imaging or atypical findings during bronchoscopy) and the cytological confirmation of malignant cells was sufficient to start surgical or oncological treatment of the patient, while 38 patients had false positive cytology reports. BBC had shown a specificity of 98.77 %, sensitivity of 83.3 %, positive predictive value of 93.5 %, and negative predictive value of 96.5 %. Imprint cytology had a specificity of 98.3 %, sensitivity of 96.5 %, positive predictive value of 94.8 %, and negative predictive value of 98.9 %. *Conclusion:* In our research BBC and imprint cytology were shown to be useful methods for the diagnosis of lung cancer, and should be considered in clinical centers where biopsy samples can only be obtained using non-guided flexible bronchoscopy or where endobronchial ultrasound bronchoscopy is not available.

Keywords: bronchial brushing cytology; imprint cytology; bronchoscopy; sensitivity; specificity; lung cancer

Corresponding author: Prof. Katarina Vukojević, MD, PhD
Department of Anatomy, Histology and Embryology
School of Medicine, University of Split
Šoltanska ul. 2A, 21000
Split, Croatia
kvukojev@gmail.com

INTRODUCTION

Lung cancer remains the leading cancer-related cause of death in men and the second most common cancer-related cause of death in women worldwide with a median survival rate of 20 % (1). One of the reasons for such high mortality rates is the fact that lung cancer is frequently diagnosed in an advanced inoperable stage. The earliest possible diagnosis for lung cancer is crucial in order to improve the survival rate of the patient (2). Only histopathological biopsy or cytological findings of atypical cells can confirm a lung cancer diagnosis (3, 4). Histopathological biopsy samples are considered to be the gold standard (5). Because all lesions are not adequate for histopathological biopsy due to their localization or degree of tumor necrosis (3), diagnostic procedures other than classic lung biopsy should be considered for the diagnosis of lung cancer (6). As early as in 1984, cytological diagnoses of sputum samples had shown to be very accurate at detecting some forms of early lung cancer (7). With new technological developments, such as the use of radial probe bronchoscopy (Radial Endobronchial Ultrasound – R-EBUS), the availability of samples for cytological diagnosis has improved exponentially (8). There are two main groups of methods which are used to obtain samples for cytology: exfoliate cytology (bronchial brushing cytology – BBC, sputum, bronchoaspirate, imprint, bronchoalveolar lavage) and fine needle cytology aspiration (9). These methods can have significant clinical differences within the same group (10). For example, BBC showed higher sensitivity than bronchoaspirate when it came to the diagnosis of endobronchial lesions (11). Since 2015, the World Health Organization (WHO) has been putting emphasis on early cancer diagnosis and the principle of the 'least amount of tissue sampling for the most accurate diagnoses', focusing on immunohistochemical staining and morphological diagnosis (12). These principles were reaffirmed in the last issue of the WHO Classification of Tumors of the Lung, Pleura, Thymus and Heart; however, the added determination of molecular markers (such as programmed death-ligand 1 – PDL-1, reactive oxygen species – ROS, anaplastic lymphoma kinase – ALK, and epidermal growth factor receptor – EGFR) increased the importance of cytological methods even further (13). Cytological methods require less tissue sampling than pathological methods. Previous studies showed that cytological findings correlate with the histopathological diagnosis; moreover, cytological samples can also be used for immunohistochemical staining and molecular markers (9, 14, 15).

The aim of this study was to assess the correlation between the most commonly used cytological methods and their histopathological findings in order to evaluate their usefulness in lung cancer diagnosis. A special focus was placed on BBC, as it is the most tissue-sparing method and can yield high diagnostic value in settings where R-EBUS is not available.

MATERIALS AND METHODS

This study was conducted at the Department of Pathology, Cytology, and Forensic Medicine of the University Hospital Mostar. Data were collected from the Department archives and the medical documentation of selected patients in the period from January 2016 to December 2020. First, a selection of 1936 patients who underwent a bronchoscopic biopsy was analyzed. Next, 508 patients were selected who had been diagnosed with lung cancer using pathological and cytological methods. This study was approved by the institutional ethics committee.

Samples were obtained by flexible fiberoptic bronchoscopy (FB). Before the FB procedure, chest computed tomography (CT) findings were reviewed, including the location and size of the target tumor and the presence of a bronchus sign (a finding in the bronchus leading to or contained within the target tumor). Brushing specimens were obtained with a sterile, single-use brush that was enclosed within a catheter sheath, and followed by bronchial washing. Tissue sampling techniques were performed using forceps endobronchial biopsy and transbronchial biopsies. Imprint cytology samples were prepared by placing forceps biopsy specimens on a glass slide and gently touching and rolling them over the surface. Special care was taken to avoid damage to the specimen.

Slides with BBC, cytospin from bronchial washing, and imprint slides were fixed in dry air and stained by the May-Grunwald Giemsa (MGG) method. The cytology and histopathology slides were viewed independently by three clinical cytologists and pathologists.

Statistical analysis

The obtained data were statistically analyzed to determine sensitivity, specificity, positive predictive value, and negative predictive value with 95% confidence inter-

vals. In the statistical data processing the Chi-square test was used. $P < 0.05$ was regarded as statistically significant. The analysis was performed using the SPSS 13.0 for Windows statistical software (SPSS Inc., Chicago, Illinois, USA).

RESULTS

In this study we collected 1936 small biopsy findings obtained by bronchoscopy, 508 of which were confirmed, either cytologically or pathologically, as lung cancer. There was a significantly higher number of men (79.29 %) diagnosed with lung cancer than women. In most cases the right lung (56.1 %) was affected, followed by the left lung (39.37 %), while a very small percentage of cancers were located bilaterally (1.77 %). In 2.76 % of cases the localization was unknown. The upper bronchi were more often affected (35.46 %) than the lower bronchi (17.53 %), while the other parts were less affected (principal bronchus 12.96 %, intermediate bronchus 9.18 %, medial basal bronchus 9.58 %, lingual segmental bronchus 8.39 %, pulmonary bronchus 6.9 %). The most common cancer was squamous cell carcinoma (33.6 %), followed by adenocarcinoma (29.45 %), and small cell lung carcinoma (20.16 %), while metastatic cancer was found in 16.79 % of cases. The youngest patient diagnosed with lung cancer was 21 years old while the oldest was 88 years old; median age was 65.

Using histopathological findings as the gold standard for lung cancer diagnosis we have found a significant degree of concordance between cytology and pathology (Table 1). Fifty patients had a positive histopathological lung cancer diagnosis with a false negative cytology report (Table 1).

Upon further investigation into the medical documentation of the 107 patients that were cytologically positive for lung cancer while they were pathologically negative, the following results were yielded: in 69 patients lung cancer had already been suspected by some other method (radiological/computed tomography – CT imaging or an atypical finding during bronchoscopy) and the cytological confirmation of malignant cells was sufficient to start the surgical or oncological treatment of the patient. Thirty-eight out of 107 patients had false positive cytology reports.

All three cytological methods have shown a statistically significant difference in their results. BBC and imprint were the most accurate methods in discovering malignant cells, while bronchoaspirate was the least accurate method (Table 2).

BBC had shown a specificity of 98.77 % (95% CI 99.36 - 99.95 %), sensitivity of 83.3 % (95% CI 78.14 - 85.23 %), positive predictive value of 93.5 % (95% CI 96.34 - 99.61 %), and negative predicitive value of 96.5 % (95% CI 95.05 - 98.12 %). Imprint cytology had a sensitivity of 96.5 % (95% CI 94.55 - 98.12 %), specificity of 98.3 % (95% CI 99.36 - 99.95 %), positive predictive value of 94.8 % (95% CI 97.9 - 99.78 %), and negative predictive value of 98.91 % (95% CI 98.23 - 99.34 %) (Table 3).

In 309 cases all three cytological methods were performed and a comparison between each method and the other two was conducted. In 130 (42.1 %) cases all three methods confirmed the presence of malignant cells in the tested samples. In 102 cases (33 %) the BBC and imprint methods were positive for malignant cells while bronchoaspirate was not. In 63 cases (20.4 %) the bron-

Table 1. *Comparison of cytological and pathological findings. Values are presented as numbers (%)*

	PATHOLOGY MALIGNANT	PATHOLOGY BENIGN	TOTAL
CYTOLOGY MALIGNANT	351 (76.6)	107 (23.4)	458 (100)
CYTOLOGY BENIGN	50 (3.4)	1428 (96.6)	1478 (100)
Total	401 (20.7)	1535 (79.3)	1936 (100)

Table 2. *Bronchial brushing cytology (BBC), bronchoaspirate, and imprint accuracy (N = 1936)*

Malignant cells	Number (%) of cases		
	BBC	Bronchoaspirate	Imprint
found	245 (83.3)	194 (42.6)	420 (96.7)
not found	49 (16.7)*	260 (57.4)*	15 (3.3)*
Total	294	454	435

Chi-square test, *P < 0.001

Table 3. *Bronchial brushing cytology (BBC) and imprint cytology sensitivity and specificity (N = 1936)*

Method	BBC	IMPRINT CYTOLOGY
Pathology-confirmed and cytology-confirmed cancer diagnoses	245 (TP*)	420 (TP*)
Pathology-confirmed and cytology-confirmed non-cancer diagnoses	1367 (TN*)	1367 (TN*)
Pathology-confirmed non-cancer diagnoses and cytology positive for cancer diagnoses	17 (FP*)	23 (FP*)
Pathology-confirmed cancer diagnoses and cytology negative for cancer diagnoses	49 (FN*)	15 (FN*)

*TP = true positive; TN = true negative; FP = false positive; FN = false negative

choaspirate and BBC methods were negative for malignant cells, while the biopsy imprint was positive. In two cases the bronchial imprint and bronchoaspirate were positive while BBC was negative for malignant cells. Comparatively, the BBC and cytological imprint methods were concordant in 234 (75.7 %) cases, of which 232 were positive for malignant cells while two were negative.

DISCUSSION

We found a significant degree of concordance between cytology and pathology for lung cancer diagnosis. Bronchial brushing cytology and imprint cytology showed high positive and negative predictive value, as well as high sensitivity and specificity for the diagnosis.

In this study, lung cancer was more frequently diagnosed in men, which is consistent with the trends shown by other studies (15). The median age of the cancer patients was 65, similar to other research results (9, 16). In addition, there was a higher incidence of squamous cell cancer than adenocarcinoma. In contrast, Dela Cruz et al. found that in the last thirty years the incidence of adenocarcinoma has increased, and become the most prevalent type of lung carcinoma (17). This discrepancy might be explained by the significant risk of both active and passive smoking in our country, due to a lack of policies that prohibit smoking in restaurants and cafes. In support of this, all patients in our cohort were smokers (89 %).

Due to the increase of lung cancer cases in our country, there is a need for accurate diagnosis in order to provide adequate lung cancer therapy. Although there have been technological advances in fiber bronchoscopy worldwide, numerous countries and centers have still not established R-EBUS as the gold standard (18-20). Namely, peripherally located neoplasms unavailable to classic fiber-bronchoscopy present a unique challenge in the case of early lung cancer diagnosis, and can often be very difficult to access for a pulmonologist (19). Therefore, pulmonologists in these countries need to invest considerable effort to overcome this difficulty, by new approaches to obtaining sufficient and required biopsy material from precise tumor locations (by bronchus sign). The bronchus sign is a sign on a CT scan that represents the presence of a bronchus leading toward a peripheral pulmonary lesion. Accordingly, most biopsies included in this study were taken by a classic bronchoscopic method, while peripherally located lesions were biopsied using transbronchial biopsy combined with CT imaging that previously found the suspected peripherally located lesion.

The importance of cytological analysis also lies in the fact that there are a number of lung cancers that are not available for histopathological biopsy, and in such cases cytological methods are needed to diagnose lung cancer as early as possible (10). The importance of molecular markers for lung cancer diagnosis in the 2021 WHO Classification of Lung Tumors has also stressed the principle of the 'least amount of tissue sampling for the most accurate diagnosis' which, in turn, placed new importance on cytological sampling (13). It is of great importance to get a sufficient number of samples, from any above-mentioned method, not only for immunohistochemical staining, but also for the usage of molecular markers (such as ROS, ALK, and EGFR) (21). This is why it is important to evaluate each cytological method currently used and determine which one would be most effective to meet the principle of 'least amount of tissue sampling for the most accurate diagnosis'.

In our study both cytological methods showed high positive and negative predictive values as well as high sensitivity and specificity for lung cancer diagnosis, which also correlated with the histopathological diagnosis. This is in accordance with previous research, indicating that cytological methods are highly useful tools in lung cancer detection (22, 23).

Although pathological diagnoses are still viewed as the gold standard, we should note that there were 69 cases in which patients were treated for lung cancer, oncologically or surgically, based on the combination of cytological and radiological findings. This can be attributed to a variety of factors, such as the methods by which the biopsies were taken, the presence of necrotic tissue, methods of preservation of the tissue samples, and potential morphological mimicry (24).

Findings in which pathology was positive and the cytological method was negative can be attributed to the localization of the tumor, the performance of the cytological method, the correct preservation of the sample, and the ability of the cytologist to accurately identify malignant cells (23).

According to the literature, the sensitivity and specificity of BBC in the diagnosis of lung cancer vary depending on the study and the technique used. A meta-analysis of bronchial brushing cytology showed a summary sensitivity of 67 % and a summary specificity of 91 % (19). In our study, BBC and cytological imprint were the most accurate methods in discovering malignant cells, while bronchoaspirate was the least accurate method. Furthermore, BBC and imprint cytology were concordant in most cases, which indicates the usefulness of combined use of these methods in lung cancer diagnosis (25). BBC had shown a specificity of 98.77 %, which was similar in other studies (19, 25). However, we found that BBC had larger sensitivity (83.3 %) in the diagnosis of lung cancer than in other studies (16). This finding might indicate a higher certainty of flexible bronchoscopy that uses the bronchus sign in the hands of experienced pulmonologists and cytologists. Namely, in our study the pulmonologists who performed flexible bronchoscopy and the cytologists who evaluated the specimens had more than 20 years of professional experience. Therefore, BBC has been shown to have high specificity and sensitivity, especially together with imprint cytology, which supports the clinician's certainty of the presence of lung cancer in the specimen and makes further invasive diagnostic procedures unnecessary. Imprint cytology had a sensitivity of 96.5 % and specificity of 98.3 %, which is consistent with the trends observed in previous research (25, 16). However, the specificity and sensitivity of BBC can be further improved with the use of advanced techniques such as ThinPrep bronchial brushing cytology (26).

CONCLUSION

In conclusion, BBC in the hands of experienced pulmonologists and cytologists can be used to increase sensitivity and specificity in the definitive diagnosis of lung cancer as well as for better cancer management. However, the WHO Reporting System for Lung Cytopathology emphasizes that an essential tool for standardizing diagnostic cytopathology practice would be of utmost importance, and could serve as a vehicle for the translation of cytopathology research into practice (27). Combining small biopsy, BBC, and imprint cytology specimens with other diagnostic techniques such as molecular testing, can improve the overall accuracy in determining the precise lung cancer type and thereby the validity of the diagnosis.

REFERENCES

1. Thandra KC, Barsouk A, Saginala K, Aluru JS, Barsouk A. Epidemiology of lung cancer. Contemp Oncol (Pozn). 2021;25(1):45-52.

2. Julian RM, Ping Y, Stephen DC, Steven ES, Alex AA. Non-Small Cell Lung Cancer: Epidemiology, Risk Factors, Treatment, and Survivorship, Mayo Clinic Proceedings 2008;83; 584-94.

3. Jeffrey K, Hobart L, Brian WH. Lung Cancer: Diagnosis, Treatment Principles, and Screening Am Fam Physician. 2022;105:487-94.

4. Chrabańska M, Środa M, Kiczmer P, Drozdzowska B. Lung Cancer Cytology: Can Any of the Cytological Methods Replace Histopathology? J Cytol. 2020;37:117-21.

5. Morgan RD, Adi FG, Belinda EC The pivotal role of pathology in the management of lung cancer J Thorac Dis. 2013;5:463-78.

6. Pelosi G, Sonzogni A, Viale G. The classification of lung carcinoma: time to change the morphology-based approach? Int J Surg Pathol. 2010;18:161-72.

7. Frost JK, Ball Jr WC, Levin ML, Tockman MS, Baker RR, Carter D, et al. Early lung cancer detection: results of the initial (prevalence) radiologic and cytologic screening in the Johns Hopkins study. Am Rev Respir Dis.1984;130:549-54.

8. Noll B, Wang WL, Gong Y, Zhao J, Kalhor N, Prieto V et al. Programmed death ligand 1 testing in non-small cell lung carcinoma cytology cell block and aspirate smear preparations. Cancer Cytopathol. 2018;126:342-52.

9. Sareen R, Pandey CL. Lung malignancy: Diagnostic accuracies of bronchoalveolar lavage, bronchial brushing, and fine needle aspiration cytology. Lung India. 2016;33:635-41.

10. Tomar V, Vijay N, Nuwal P, Dixit R. Comparative study of bronchoalveolar lavage, bronchial brushing, and FNAC in diagnosing malignant neoplasms of lungs. J Cytol. 2016;33:210-13.

11. Deepali J, Sinchita R. Molecular Pathology of Lung Cancer Cytology Specimens: A Concise Review. Arch Pathol Lab Med. 2018;142:1127-33.

12. Travis WD, Brambilla E, Nicholson AG, Yatabe Y, Austin JHM, Beasley MB et al. The 2015 World Health Organization Classification of Lung Tumors: Impact of Genetic, Clinical and Radiologic Advances Since the 2004 Classification. J Thorac Oncol. 2015;10:1243-60.

13. Nicholson AG, Tsao MS, Beasley MB, Borczuk AC, Brambilla E, Cooper WA, et al. The 2021 WHO Classification of Lung Tumors: Impact of Advances Since 2015. J Thorac Oncol. 2022;17(3):362-87

14. Alberg AJ, Brock MV, Samet JM. Epidemiology of Lung Cancer: Looking to the Future Journal of Clinical Oncology 2005;23:3175-85.

15. Stabellini N, Bruno DS, Dmukauskas M, Barda AJ, Cao L, Shanahan J, et al. Sex Differences in Lung Cancer Treatment and Outcomes at a Large Hybrid Academic-Community Practice. JTO Clin Res Rep. 2022;3(4):100307.

16. Chowdhury A. Evaluation of imprint smears of bronchoscopic biopsy in lung tumors: A cytohistological correlation. J Cytol. 2019;36:157-9.

17. Dela Cruz CS, Tanoue LT, Matthay RA. Lung cancer: epidemiology, etiology, and prevention. Clin Chest Med. 2011;32(4):605-44.

18. Cheng-Chieh C, Chyi-Huey B, Kang-Yun L, Yu-Ting C, Shien-Tung P, Yuan-Hung W. Evaluation of the diagnostic accuracy of bronchial brushing cytology in lung cancer: A meta-analysis Cancer Cytopathology September 2021;129:739-49.

19. Sampsonas F, Kakoullis L, Lykouras D, Karkoulias K, Spiropoulos K. EBUS: Faster, cheaper and most effective in lung cancer staging. Int J Clin Pract. 2018;72(2).

20. Kuo CH, Lin SM, Lee KY, Chung FT, Lo YL, Hsiung TC, et al. Endobronchial ultrasound-guided transbronchial biopsy and brushing: a comparative evaluation for the diagnosis of peripheral pulmonary lesions. Eur J Cardiothorac Surg. 2014;45:894-8.

21. Katarzyna W, Iwona B-L, Łukasz T, Mariola Ś-M. Genetic Markers in Lung Cancer Diagnosis: A Review Int J Mol Sci. 2020;2:45-69.

22. Payne CR, Hadfield JW, Stovin PG, Barker V, Heard BE, Stark JE. Diagnostic accuracy of cytology and biopsy in primary bronchial carcinoma. Journal of Clinical Pathology 1981;34:773-8.

23. Idowu MO, Powers CN. Lung cancer cytology: potential pitfalls and mimics - a review Int J Clin Exp Pathol. 2010;3:367-85.

24. Ericson Lindquist K, Ciornei C, Westbom-Fremer S, Gudinaviciene I, Ehinger A, Mylona N, et al. Difficulties in diagnostics of lung tumours in biopsies: an interpathologist concordance study evaluating the international diagnostic guidelines Journal of Clinical Pathology 2022;75:302-9.

25. Michels G, Topalidis T, Büttner R, Engels M, Pfister R. Usefulness of imprint and brushing cytology in diagnosis of lung diseases with flexible bronchoscopy. J Clin Pathol. 2012;65:649-53.

26. Liu C, Wen Z, Li Y, Peng L. Application of ThinPrep Bron-

chial Brushing Cytology in the Early Diagnosis of Lung Cancer: A Retrospective Study. PLoS ONE 2014;9(4):e90163.

27. International Academy of Cytology – International Agency for Research on Cancer – World Health Organization Joint Editorial Board WHO Reporting System for Lung Cytopathology IAC-IARC-WHO cytopathology reporting systems series (1st ed), International Agency for Research on Cancer, Lyon (France) (2022).

SAŽETAK

DIJAGNOSTIČKA TOČNOST CITOLOGIJE OBRISKA ČETKICOM I CITOLOGIJE OTISKA U DIJAGNOSTICI TUMORA PLUĆA UZORAKA DOBIVENIH KORIŠTENJEM FLEKSIBILNOG BRONHOSKOPA

I. RAGUŽ[1], V. ŠOLJIĆ[1,2,3], J. MIŠKOVIĆ[4], T. ZOVKO[5], A. KOLOBARIĆ[3], K. VUKOJEVIĆ[2,3,6]

[1]Klinički zavod za patologiju, citologiju i sudsku medicinu, Sveučilišna klinička bolnica Mostar, Mostar, Bosna i Hercegovina [2]Fakultet zdravstvenih studija, Sveučilište u Mostaru, Bosna i Hercegovina [3]Medicinski fakultet, Sveučilište u Mostaru, Zavod za histologiju i embriologiju, Bosna i Hercegovina [4]Klinika za kirurgiju, Sveučilišna klinička bolnica Mostar, Mostar, Bosna i Hercegovina [5]Odjel za plućne bolesti, Sveučilišna klinička bolnica Mostar, Mostar, Bosna i Hercegovina [6]Medicinski fakultet Sveučilišta u Splitu, Centar za translacijska istraživanja u biomedicini

Cilj: Cilj našeg istraživanja bio je procijeniti osjetljivost, specifičnost, pozitivnu i negativnu prediktivnu vrijednost citološkog uzorka četkanja bronha i citologije otiska uzorka biopsije te njihovu korisnost u dijagnostici raka pluća korištenjem nenavođene fleksibilne bronhoskopije. *Materijali i metode:* Istraživanje je provedeno na Odjelu za patologiju, citologiju i sudsku medicinu Sveučilišne kliničke bolnice Mostar. Podaci su prikupljani iz arhive u razdoblju od siječnja 2016. do prosinca 2020. te su skupljeni podaci za 1936 bolesnika. U istraživanje je uključeno 508 bolesnika koji su imali patohistološki i/ili citološki potvrđen karcinom pluća. Uzorci su dobiveni fleksibilnom fiberoptičkom bronhoskopijom. Uzorci za četkanje bronha dobiveni su sterilnom četkicom za jednokratnu uporabu koja je bila zatvorena unutar omotača katetera i nakon toga je provedeno ispiranje bronha. Otisak dobivenog uzorka napravio se nakon endobronhalne biopsije i transbronhalne biopsije. Citološke i histopatološke rezove neovisno su pregledala tri klinička citologa i patologa. *Rezultati:* Korištenjem histopatoloških nalaza kao „zlatnog standarda" za dijagnozu raka pluća, pronašli smo značajan stupanj podudarnosti između citologije i patologije ($\kappa = 0,135$; $P < 0,001$). Međutim, 107 bolesnika bilo je citološki pozitivno na karcinom pluća, dok su patološki bili negativni. Daljnjim istraživanjem njihove povijesti bolesti pronašli smo sljedeće rezultate: u 69 bolesnika se na rak pluća već sumnjalo na temelju neke druge dijagnostičke metode (radiološkim/kompjutorsko tomografskim snimanjem ili atipičnim nalazom tijekom bronhoskopije) i citološka potvrda zloćudnih stanica bila je dovoljna da se započne kirurško ili onkološko liječenje bolesnika, dok je 38 bolesnika imalo lažno pozitivne citološke nalaze. Bronhalna četkica pokazala je specifičnost od 98,77 %, osjetljivost od 83,3 %, pozitivnu prediktivnu vrijednost od 93,5 %, a negativnu prediktivnu vrijednost od 96,5 %. Citologija otiska biopsije imala je specifičnost od 98,3 %, osjetljivost od 96,5 %, pozitivnu prediktivnu vrijednost od 94,8 %, a negativnu prediktivnu vrijednost od 98,9 %. *Zaključak:* U našem istraživanju pokazalo se da su citologija četkanja bronha i otiska biopsije korisni postupci za dijagnosticiranje raka pluća i treba ih razmotriti u kliničkim središtima gdje se citološki uzorci i biopsija mogu dobiti samo nenavođenom fleksibilnom bronhoskopijom ili gdje endobronhalna ultrazvučna bronhoskopija nije dostupna.

Ključne riječi: citologija bronhalnog obriska četkicom, bronhoskopija, osjetljivost, specifičnost, rak pluća

Autor za korespondenciju: prof. dr. sc. Katarina Vukojević, dr. med.
Zavod za anatomiju, histologiju i embriologiju
Medicinski fakultet, Sveučilište u Splitu
Šoltanska ul. 2A, 21000
Split, Hrvatska
kvukojev@gmail.com