Autofluorescence and White Light Bronchoscopy in the Diagnosis of Endobronchial Malignant Lesions

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Background: Autofluorescence bronchoscopy (AFB) allows a more sensitive approach to the diagnosis of premalignant and malignant endobronchial lesions than white light bronchoscopy (WLB) can do.

Aim: To assess the autofluorescence bronchoscopy and white light bronchoscopy in diagnosing malignant endobronchial lesions.

Materials and methods: The design of the study is a retrospective case-control study. Thirty-two parameters were entered into an Excel file and analysed with SPSS v. 21 for Mac book Pro. Endoscopy findings were graded in 4 options and morphological results - in 9 options according to WHO classification. The results are presented using McNemar's test and sensitivity, specificity and positive and negative predictive values as well.

Results: Three hundred and three patients were included in the study. Lung cancer was found in 38.3% of the patients using histology and in 35.6% - using cytology. McNemar's test for AFB finding for suspected and malignant lesions OR was 8.333 (95% CI 3.571 -23.784) while for WLB OR was 0.128 (95% CI 0.045 -0.299). For cytological results OR was 3.800 (95% CI 2.123 -7.227) and 3.471 (95% CI 1.996 -6.351), respectively. P value was <0.0001 for all tests. Sensitivity for AFB and WLB was 94.83% but specificity was 52.83% and 55.66% if histology was used. For cytology these numbers were respectively 86.11% and 84.26% for sensitivity, and 63.69% and 62.42% for specificity.

Conclusion: AFB has an advantage over WLB in diagnosing endobronchial malignant lesions. Biopsying suspicious, not only visible malignant lesions, increased diagnostic sensitivity.

BACKGROUND

Lung cancer is a major medical problem, especially with its high mortality rate. In this regard, early diagnosis is extremely important. With the introduction of the flexible white light bronchoscopy (WLB) it is possible to take endobronchial biopsies in the visual field of the bronchoscopist to sub-segmental level. The choice of the biopsy site depends on visual information and bronchoscopist experience. Autofluorescence bronchoscopy (AFB) uses autofluorescence light which makes premalignant and malignant endobronchial lesion more visible by highlighting them in different colors. It has helped us target biopsy techniques more precisely. Our aim was to compare the performance of these two methods in diagnosing lung cancer by conducting the present retrospective study.

MATERIALS AND METHODS

Evis Lucera (CV-260SL) autofluorescence imaging system (AFI) (Olympus Medical Systems, Tokyo, Japan) was used in the study. White light mode was used first and then the autofluorescent mode. Finally, the biopsies were performed according the decision of the bronchoscopist.

The information concerning the performed bronchoscopies and biopsy results was gathered from our hospital information system. The follow-up period was one year; the study included 303 patients: 232 men (76.6%) and 71 women (23.4%). Mean age of men was 61.38±9.56 years, and of women - 63.06±10.231 years. The data were analysed using...
Excel and SPSS Ver. 21 statistics software package on a MacBook Pro.

The registered parameters were patient’s name (initials), age and sex, presence of endobronchial changes, type of endobronchial changes observed during white light bronchoscopy, type of endobronchial changes observed during autofluorescence bronchoscopy, performed forceps biopsy, performed catheter and brush biopsy, pathology and cytology results.

The study followed a retrospective case-control design.

Analysis of the results was done by statistical analysis of nonparametric data. McNemar’s test was used to test the hypothesis that AFB targets the place for biopsy better than WLB. The critical level of significance was $\alpha = 0.05$. The corresponding null hypothesis is rejected when the p value is less than $\alpha$.1-3

We used a 2×2 data table, identifying the diagnostic values of the methods used to calculate the sensitivity, specificity and positive and negative predictive values.

RESULTS

To describe and classify the endobronchial changes we used a four-grade visual scale classifying the findings: normal mucosa, abnormal but not suspicious, suspicious for tumor, and tumor. The observed endobronchial changes in the two methods were: WLB - slightly pink mucosa, hyperemia and/or swelling, infiltration or suspicion and visible tumor; AFB - green coloured mucosa, dark green to light crimson, crimson with distinct borders, visible tumor.4,5

To evaluate the histology and cytology results, we used the WHO recommended scale - changes are classified into 9 types according to the findings.6

The compilation between these two groups of data is shown in Tables 1 and 2 for histology results, and Tables 5 and 6 for cytology results. Sample obtainment method in Tables 1 and 5 is WLB, while Tables 2 and 6 are AFB.

Two hundred and twenty-two patients had a forceps biopsy. Lung carcinoma was found in 116 patients (38.3%). These patients had invasive carcinoma, microinvasive carcinoma, and carcinoma in situ.

The patients with carcinoma are the same number as in these examined with WLB. The differences are in the assessment of the endobronchial changes.

To compare two type of bronchoscopy using a 2×2 table groups of true positive, true negative, false positive and false negative cases have to be defined.

True positive changes were these in which the bronchoscopy found a tumor and the biopsy showed a tumor. This means invasive carcinoma, microinvasive carcinoma, and carcinoma in situ. True negative cases were those with negative bronchoscopy and no tumor in the biopsy. False positive cases were those in which bronchoscopy found a tumor, but biopsy was negative. False negative means that the bronchoscopist did not find a tumor but the biopsy did.

We tested two options for a true positive group. Tests were performed using two different definitions for a true positive group. In the first one, both suspicious and actual tumorous changes are considered a true positive endoscopic findings. In the second definition, only actual tumorous changes are accepted. The WLB and AFB datasets in the histology and cytology tables include results representing both definitions.

To examine the relationship between the endobronchial changes and histology findings, a test for nonparametric data is used.

The results from applying McNemar’s test are shown in Table 3. It is evident that in the first variant of distribution, in both WBL and AFB, there is a statistical relationship between the bronchoscopic and morphological results in the diagnostic approach of lung cancer (p<0.0001). The first variant demonstrates that it is better to perform biopsy not only on suspicious changes as well, rather than tumorous ones alone.

The Odds Ratio is significantly higher in AFB 8.333 (95% CI 3.571 -23.784), than 0.128 (95% CI 0.045 -0.299) for WLB.

The diagnostic sensitivity, specificity and positive and negative predictive values in two tested variants of the results are shown in Table 4.

In the second variant the sensitivity is higher in AFB (83.62%) versus (78.45%) in WLB. The same is true with the negative predictive value in AFB (81.73%) versus (77.27%) in WLB. The success in finding visible cancer is slightly higher with fluorescence than without it. Additionally, if the test is negative, results are even more reliable, given the same mode of investigation is used.

Cytology results are presented in the same nine grade scale for morphological results and four types endoscopic changes.

Lung carcinoma was diagnosed by cytology in 108 patients which is 35.6% of all participants. This
number also includes invasive carcinoma, microinvasive carcinoma and carcinoma in situ.

Here, using cytology biopsies, only 1 carcinoma in situ was found, while histology discovered 3 cases.

To evaluate the relationship between the endobronchial changes and cytology results, the same nonparametric test is used.

The results using McNemar’s test are shown in Table 7. Again, only in the first variant of result distribution, in both WLB and AFB, there is a statistical relationship between bronchoscopic and morphological results in the diagnostic approach of lung cancer. Odds Ratio is 3.800 (95% CI 2.123 -7.227) for AFB against 3.471 (95% CI 1.996 -6.351) for WLB. Best biopsy results are achieved after suspicious and tumorous changes have been examined with AFB.

The diagnostic sensitivity, specificity and positive and negative predictive values in two tested variants of the cytology results are shown in Table 8. The diagnostic sensitivity of the first option of AFB is slightly higher than the same in WBL (86.11% against 84.26%). Other results from tests for specificity, PPV and NPV support a similar verdict of AFB being advantageous over WLB in the diagnosis of lung cancer with cytological biopsies when suspected and tumor endobronchial cases are used as a target.

**DISCUSSION**

Autofluorescence bronchoscopy, as a mode of diagnostic bronchoscopy, is superior to white light

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**Table 1. Results from white light bronchoscopy and histology**

|                  | 1. Normal | 2. Abnormal | 3. Suspicious | 4. Tumor | Row total |
|------------------|-----------|-------------|---------------|----------|-----------|
| 1. Inflammation  | 2         | 7           | 5             | 4        | 18        |
| 2. Hyperplasia   | 4         | 16          | 2             | 7        | 29        |
| 3. Mild dysplasia| 4         | 18          | 11            | 7        | 40        |
| 4. Moderate dysplasia | 1  | 5          | 7             | 1        | 14        |
| 5. Severe dysplasia | 0  | 2           | 1             | 2        | 5         |
| 6. Carcinoma in situ | 0 | 1           | 1             | 1        | 3         |
| 7. Microinvasive carcinoma | 0 | 1          | 4             | 6        | 11        |
| 8. Carcinoma     | 2         | 2           | 14            | 84       | 102       |
| Unsuitable material | 0 | 0           | 0             | 0        | 0         |
| Column total     | 13        | 52          | 45            | 112      | 222       |

**Table 2. Results from autofluorescence bronchoscopy and histology**

|                  | 1. Normal | 2. Abnormal | 3. Suspicious | 4. Tumor | Row total |
|------------------|-----------|-------------|---------------|----------|-----------|
| 1. Inflammation  | 8         | 3           | 4             | 3        | 18        |
| 2. Hyperplasia   | 5         | 12          | 6             | 6        | 29        |
| 3. Mild dysplasia| 6         | 17          | 10            | 7        | 40        |
| 4. Moderate dysplasia | 0  | 4           | 8             | 2        | 14        |
| 5. Severe dysplasia | 0  | 1           | 1             | 3        | 5         |
| 6. Carcinoma in situ | 0 | 1           | 1             | 1        | 3         |
| 7. Microinvasive carcinoma | 0 | 2          | 2             | 7        | 11        |
| 8. Carcinoma     | 1         | 2           | 10            | 89       | 102       |
| Unsuitable material | 0 | 0           | 0             | 0        | 0         |
| Column total     | 20        | 42          | 42            | 112      | 222       |
In this regard the results from statistical analyses rejected the null hypothesis and accepted alternative one.

In histology biopsies group, first variant of testing, \( p < 0.0001 \). Odds Ratio is higher in the AFB group, \( 8.333 \text{ (95% CI 3.571-23.784)} \) against \( 0.128 \text{ (95% CI 0.045-0.299)} \). Sensitivity is high enough - 94.83% and the same applies to both modes. This demonstrates that using the suspected changes for guidance, in addition to the visible malignant ones, yields better results (Tables 3, 4). This is understandable in the context of the fact that AFB gets better results in diagnosing endobronchial premalignant lesions.7,8

Regarding this analysis for cytology findings (Tables 7, 8), that the same first variant grouping of the results, showed significant relationship between the biopsy place and the positive results \( (p<0.0001) \). Here the advantage of AFB comparing
Table 6. Distribution of cytology results according to AFB finding

|                | 1. Normal | 2. Abnormal | 3. Suspicious | 4. Tumor | Row total |
|----------------|-----------|-------------|---------------|----------|-----------|
| 1. Inflammation| 38        | 9           | 3             | 14       | 64        |
| 2. Hyperplasia | 19        | 22          | 8             | 15       | 64        |
| 3. Mild dysplasia| 2        | 5           | 1             | 5        | 13        |
| 4. Moderate dysplasia| 2      | 1           | 2             | 6        | 11        |
| 5. Severe dysplasia| 2       | 0           | 3             | 0        | 5         |
| 6. Carcinoma in situ| 0      | 0           | 0             | 1        | 1         |
| 7. Microinvasive carcinoma| 0 | 3           | 4             | 9        | 16        |
| 8. Carcinoma | 4         | 8           | 16            | 63       | 91        |
| 9. Unsuitable material| 0      | 0           | 0             | 3        | 3         |
| Column total   | 67        | 48          | 37            | 116      | 268       |

WLB is weak - OR 3.800 (95% CI 2.123-7.227) against 3.471 (95% CI 1.996-6.351). The rejection of the null hypothesis and the acceptance of alternative one is not so obvious.

Sensitivity, specificity, positive predictive value and negative predictive value are slightly higher in AFB group, first variant of testing (Table 8).

In literature the sensitivities vary from 44% to 100%.9,10 In the two meta-analyses the sensitivity is 90% and 94.7%.11,12 In cases of severe dysplasia and malignancy Ueno K et al. showed sensitivity of 94.7% with AFB and 73.7% with WLB.13 The high sensitivity in our study is 94.83% for AFB and WLB histology and 86.11% for AFB cytology results.

This big differences in sensitivity is due mainly to the definition of case positive group. Some of the authors define this as patients with invasive cancer only, while others add preinvasive lesions to it. The premalignant lesions can also be added to this group and this leads to a lowering of the sensitivity again. The second reason is the heterogeneity of

Table 7. Values of McNemar’s test according to the cytology results

|                | 1. Variant WLB | 1. Variant AFB | 2. Variant WLB | 2. Variant AFB |
|----------------|----------------|----------------|----------------|----------------|
| Odds Ratio     | 3.471 (95% CI 1.996-6.351) | 3.800 (95% CI 2.123-7.227) | 1.000 (95% CI 0.617-1.622) | 1.143 (95% CI 0.708-1.853) |
| p             | < 0.0001 | < 0.0001 | = 0.9075 | = 0.6442 |
| \(\chi^2\)    | 22.118    | 23.347    | 0.014    | 0.213    |

Table 8. Diagnostic yield of cytology in AFB and WLB

|                | 1. Variant WLB | 1. Variant AFB | 2. Variant WLB | 2. Variant AFB |
|----------------|----------------|----------------|----------------|----------------|
| Sensitivity    | 84.26%         | 86.11%         | 65.74%         | 67.59%         |
| Specificity    | 62.42%         | 63.69%         | 76.43%         | 74.52%         |
| PPV            | 60.67%         | 62.00%         | 65.74%         | 64.60%         |
| NPV            | 85.22%         | 86.96%         | 76.43%         | 76.97%         |

PPV: positive predictive value; NPV: negative predictive value
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the designs of the conducted studies.

The specificity in our study is between 52.83% in variant 1 of grouping using AFB to 80.19% in variant 2 grouping of histology results. In meta-analysis this results are 56% and 60.9%.

The reported specificity from different colleagues is from 23%, 26% to 82%, 83.3% and 92%, 4, 7, 14-16

Actually the specificity of AFB and WLB is low because these investigations have difficulties in assessing the difference between benign and premalignant/malignant lesions. 12

We assume our results are consistent with most of the published ones and we believe that our conclusions are credible.

The highest results for sensitivity and specificity are published by B. Zaric et al. 4 He and his co-workers use the same system, as ours - autofluorescence imaging system (AFI), (Olympus Medical System Corp., Tokyo, Japan).

Other authors that use the same system are TW Jang, F Herth, EJ Cetti and M Chiyo. 7, 16-18 This system is likely one of the best suited currently available, because AFI displays a light green image for normal epithelium and magenta for an abnormal fluorescence, depending on the condition of abnormal epithelium.

Some authors use other systems like D-Light, which is manufactured by Karl Storz, Germany. 8

What makes it less suitable for this method of tumor detection is the use of correction of the observational techniques. It requires an endoscope of specific design that includes a filter wheel with two different positions for the white light mode and the autofluorescence mode.

The Onco-LIFE system is used by P. Lee et al. 5

Onco-LIFE combines fluorescence and reflectance imaging with aims to reduce false-positive fluorescence. It is due to increased vascularity frequently associated with airway inflammation. The Onco-LIFE device allows composite quantification of red reflectance and green fluorescence intensity signals by numerically expressing the red-to-green ratio (R/G ratio) of the area of interest.

Stringer MR et al. used the Xillix LIFE lung System. 19 AFB was first developed at the British Columbia Cancer Research Centre (Vancouver, BC, Canada) and became commercially available in 1998. The original LIFE-Lung1 system used a helium-cadmium laser for illumination and detected the emitted red and green autofluorescent light with two image-intensified charge-coupled device (CCD) cameras. Normal areas appear green and abnormal areas appear reddish brown, owing to reduced green autofluorescence in pre-neoplastic and neoplastic lesions.

All these systems demonstrate similar results, where AFB outperforms WLB, especially in the cases of diagnostic approach of premalignant endobronchial changes. 11, 12, 14

If a bronchoscopy unit has an equipment which allows it to perform AFB it is obvious that it can be used as a supplement in the course of routine WLB. Better visualisation of the epithelium and better targeting during biopsy procedures are significant advantages. The disadvantages are the high price of the equipment and the low specificity. 20-22

CONCLUSION

The results of this study confirmed the findings of other authors that AFB has better diagnostic value than WLB in diagnosing endobronchial carcinoma in situ, microinvasive carcinoma and invasive carcinoma together.

The acceptance of the suspected and malignant changes as a target and performing biopsy at this point, increase the sensitivity of both WLB and AFB.

The exclusion of malignant endobronchial disease is less possible, same as published by other authors. AFB is comfortable, easy and effective method for diagnostic approach of endobronchial lung cancer when the equipment is available.

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REFERENCES

1. Conover WJ. Practical nonparametric statistics. 3rd ed. New York: Wiley; 1999. pp. 166-9.
2. Fleiss JL, Levin B, Paik MC. Statistical methods for rates and proportions. 3rd ed. New York: John Wiley & Sons; 2003. p. 375.
3. Bland M. An introduction to medical statistics. 3rd ed. Oxford: Oxford University Press; 2000.
4. Zaric B, Perin B, Carapic V, et al. Diagnostic value of autofluorescence bronchoscopy in lung cancer. Thorac Cancer 2013;4(1):1-8.
5. Lee P, van den Berg RM, Lam S, et al. Color fluorescence ratio for detection of bronchial dysplasia and carcinoma in situ. Clin Cancer Res 2009;15(14):4700-5.
6. Holiday D, McLarty J, Farley M, et al. Sputum cytology within and across laboratories. A reliability study. Acta Cytol 1995;39:195-206.
7. Chiyo M, Shibuya K, Hoshino H, et al. Effective detection of bronchial preinvasive lesions by a new autofluorescence imaging bronchovideoscope system. Lung Cancer 2005;48:307-13.

8. Häussinger K, Becker HD, Stanzel F, et al. Autofluorescence bronchoscopy with white light bronchoscopy compared with white light bronchoscopy alone for the detection of precancerous lesions: a European randomized controlled multicenter trial. Thorax 2005;60:496-503.

9. Edell E, Lam S, Pass H, et al. Detection and localization of intraepithelial neoplasia and invasive carcinoma using fluorescence-reflectance bronchoscopy: an international, multicenter clinical trial. J Thorac Oncol 2009;4:49-54.

10. Divisi D, Di Tommaso S, De Vico A, et al. Early diagnosis of lung cancer using a SAFE-3000 autofluorescence bronchoscopy. Interact Cardiovasc Thorac Surg 2010;11:740-4.

11. Chen W, Gao X, Tian Q, et al. A comparison of autofluorescence bronchoscopy and white light bronchoscopy in detection of lung cancer and preneoplastic lesions: a meta-analysis. Lung Cancer 2011;73:183-8.

12. Sun J, Garfield DH, Lam B, et al. The value of autofluorescence bronchoscopy combined with white light bronchoscopy compared with white light alone in the diagnosis of intraepithelial neoplasia and invasive lung cancer: a meta-analysis. J Thorac Oncol 2011;6:1336-44.

13. Ueno K, Kusunoki Y, Imamura F, et al. Clinical experience with autofluorescence imaging system in patients with lung cancers and precancerous lesions. Respiration 2007;74:304-8.

14. Chhajed PN, Shibuya K, Hoshino H, et al. A comparison of video and autofluorescence bronchoscopy in patients at high risk of lung cancer. Eur Respir J 2005;25:951-5.

15. Lam B, Wong MP, Fung SL, et al. The clinical value of autofluorescence bronchoscopy for the diagnosis of lung cancer. Eur Respir J 2006;28:915-9.

16. Cetti EJ, Nicholson AG, Singh S, et al. An evaluation of a videobronchoscopy-based autofluorescence system in lung cancer. Eur Respir J 2010;35:1185-7.

17. Jang TW, Oak CH, Chun BK, et al. Detection of preinvasive endobronchial tumors with D-light/autofluorescence system. Korean Med Sci 2006;21:242-6.

18. Herth FJF, Eberhardt R, Anantham D, et al. Narrow-band imaging bronchoscopy increases the specificity of bronchoscopic early lung cancer detection. J Thorac Oncol 2009;4:1060-5.

19. Stringer MR, Moghissi K, Dixon K. Autofluorescence bronchoscopy in volunteer asymptomatic smokers. Photodiagnostics Photodyn Ther 2008;5:148-52.

20. Hanibuchi M, Yano S, Nishioka Y, et al. Autofluorescence bronchoscopy, a novel modality for the early detection of bronchial premalignant and malignant lesions. J Med Invest 2007;54:261-6.

21. Beamis JF, Ernst A, Simoff M, et al. A multicenter study comparing autofluorescence bronchoscopy to white light bronchoscopy using a nonlaser light stimulation system. Chest 2004;125(Suppl):148S-9S.

22. Hirsch FR, Prindiville SA, Miller YE, et al. Fluorescence versus white-light bronchoscopy for detection of preneoplastic lesions: a randomized study. J Natl Cancer Inst 2001;93:1385-91.
Аутофлюоресцентная и флуоресцентная бронхоскопия при диагностике злокачественных поражений эндобронхиальной системы

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Введение: Аутофлюоресцентная бронхоскопия (АФБ) позволяет более тщательный подход к диагностике предраковых и злокачественных поражений эндобронхиальной системы, чем флуоресцентная бронхоскопия (ФБ).

Цель: Осуществить оценку аутофлюоресцентной и флуоресцентной бронхоскопии при диагностике злокачественных поражений эндобронхиальной системы.

Материалы и методы: Тип исследования - ретроспективное исследование случай-контроль. Тридцать два параметра были включены в файл Excel и проанализированы статистическим программным обеспечением SPSS v. 21 для Mac book Pro. Эндоскопические исследования были классифицированы в 4 вариантах, а морфологические результаты - в 9 вариантах в соответствии с классификацией ВОЗ. Результаты представлены при помощи теста Мак-Немара, а также чувствительностью, специфичностью и положительными и отрицательными прогностическими значениями.

Результаты: Триста три пациента были включены в исследование. Рак лёгких был установлен у 38.3% пациентов при помощи гистологии и у 35.6% - при помощи цитологии. КВ (коэффициент вероятности) теста Мак-Немара для АФБ находок предполагаемых и злокачественных поражений составил 8.333 (95% CI 3.571-23.784), в то время как для ФБ составил 0.128 (95% CI 0.045-0.299). Для цитологических результатов КВ составлял 3.800 (95% CI 2.123-7.227) и 3.471 (95% CI 1.996-6.351) соответственно. Значение Р составляет <0.0001 для всех тестов. Чувствительность АФБ и ФБ составила 94.83%, но специфичность составила 52.83% и 55.66% с использованием цитологии. Для цитологии эти показатели: для чувствительности 86.11% и 84.26%, а для специфичности - 63.69% и 62.42%.

Выводы: АФБ имеет преимущество перед ФБ в диагностике злокачественных поражений эндобронхиальной системы. Биопсия предполагаемых, а не только видимых злокачественных поражений увеличила диагностическую чувствительность.