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LITERATURE REVIEW: COMPARATIVE ANALYSIS OF SPUTUM CYTOLOGY EXAMINATION METHODS & FINE NEEDLE ASPIRATION (FNAB) FOR LUNG CANCER

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Abstract. Cancer remains one of the biggest medical challenges, with high mortality rates due to late detection and limited treatment. In 2020, Indonesia saw 396,914 new cancer cases and 234,511 cancer deaths. The purpose of this paper is to provide a strong foundation for the research being conducted, by utilizing knowledge and findings from previous studies related to the FNAB method and sputum cytology in patients with lung cancer. The sources used in this writing are Google, NIH, NCBI, and other national journals. The selection of methods must be adjusted to the patient's condition, risk factors, and the availability of medical facilities, with the main objective of achieving a rapid, accurate, and precise diagnosis, so as to determine the most appropriate therapy for lung cancer patients. This study shows that FNAB and sputum cytology have their respective advantages in the diagnosis of lung cancer. FNAB is highly effective for diagnosing small lung nodules, especially in high-risk patients, due to its high accuracy and ability to provide more detailed diagnostic information. In contrast, sputum cytology is more suitable for early detection and screening in high-risk populations, although its accuracy is lower and limited to certain types of cancer.

Keywords: Lung Cancer, Sputum Cytology, Fine Needle Aspiration.

INTRODUCTION

Cancer remains one of the biggest medical challenges, with high mortality rates due to late detection and limited treatment. In 2020, Indonesia saw 396,914 new cancer cases and 234,511 cancer deaths. Breast cancer is the highest type of cancer in women, while lung cancer is the highest in men. In 2020, there were an estimated 18.1 million new cancer cases worldwide. Cancers are the leading cause of death in the world, with nearly 10 million deaths in 2020.[1,2]

In 2022, it is estimated that there will be 236,740 new cases of lung and bronchial cancer (117,910 in men and 118,830 in women), and 130,180 deaths (68,820 in men and 61,360 in women) due to the disease. The causes of lung cancer vary, but smoking is considered the main factor that increases the risk of this disease. The danger of lung cancer lies not only in the high mortality rate, but also in the serious complications that can occur, such as hemoptysis, where 20-60% of patients experience coughing up blood, and 5-10% of them are massive, which can be life-threatening if not treated immediately. This shows the importance of prevention, early detection, and appropriate treatment to reduce the fatal impact of this disease.[3,4]

With an increasing mortality rate, lung cancer is often diagnosed late because the symptoms are similar to other respiratory illnesses, such as coughing or shortness of breath. Therefore, early detection is crucial to increase the life expectancy of lung cancer patients. For this reason, fast, accurate and affordable diagnostic tests are needed.[5] One method widely used to diagnose lung cancer is cytology examination, which can be performed through a sputum (phlegm) sample or fine needle aspiration (FNA) of suspicious lung tissue.[6] Cytologic examination works by identifying abnormalities in cells taken from the body, be it cancer cells or altered tissue cells. In lung cancer, cytology techniques can be performed using sputum cytology or fine needle aspiration (FNA), which allows the identification of cancer cells present in the respiratory tract or lung nodules.

METHOD

This study used a literature study method from data obtained on Google Scholar, NIH, NCBI, and several other national journals. The study aimed to analyze differences in the cytological examinations used, such as sputum cytology and fine needle aspiration (FNA). Furthermore, it assessed whether these techniques are effective in the diagnosis of lung cancer, based on data from the 4 journals used as references. The findings are expected to provide valuable insights into the accuracy and reliability of these diagnostic methods in clinical practice.

RESULTS AND DISCUSSION

Based on several studies that have been conducted and collected, the results obtained are.

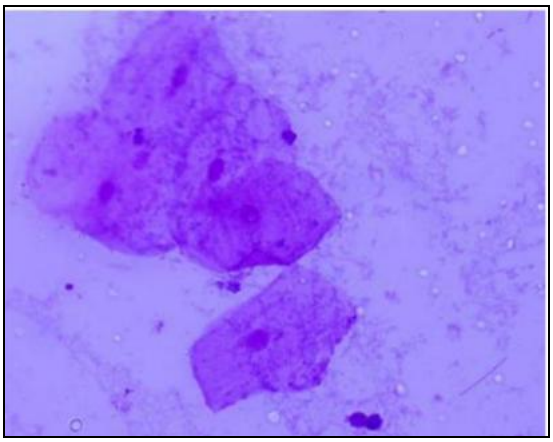

Figure 1. Sputum cytology method results

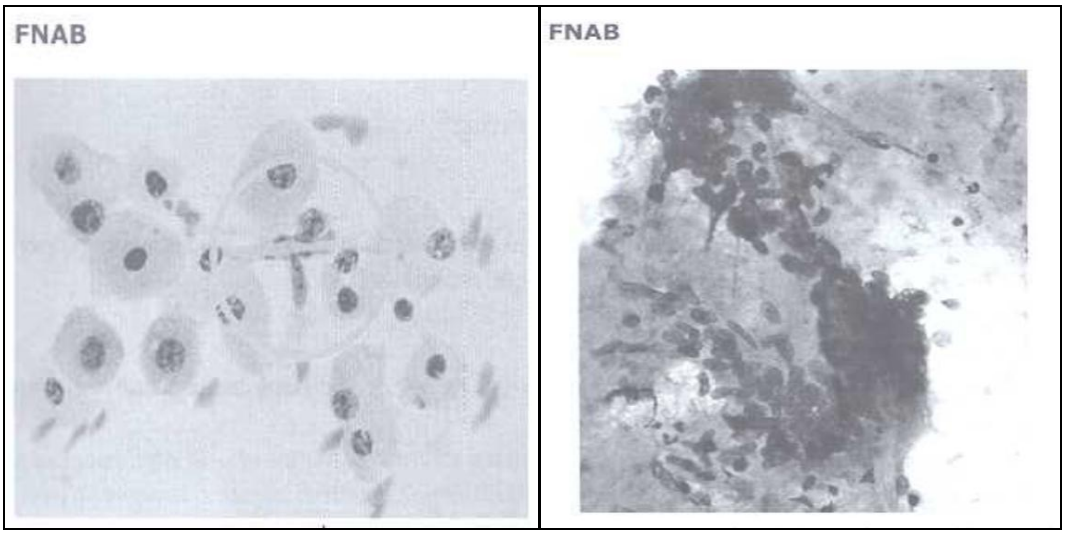

Figure 2. Method fine needle aspiration biopsy (FNAB)

Table 1. Comparison table of sputum cytology and fine needle aspiration (FNAB) examination methods for lung cancer

No	Author	Year	Title	Method	Result
1	Hardian, S ,Yenita, Mayorita, P.	2023	Sputum Staining and Diagnosis Techniques in Lung Cancer.	Sputum cytology, using Papanicolaou and May Grunwald Giemsa stains	These methods have their own advantages. Some types of lung malignancies that can often be assessed from sputum samples are squamous cell carcinoma, adenocarcinoma, and small cell carcinoma. Whereas large cell carcinoma is inadequate to be assessed from sputum samples.
2	Ammanagi A. S., Dombale V. D., Miskin A. T., Dandagi G. L.1 , Sangolli S. S.2	2012	Sputum cytology in suspected cases of carcinoma of lung (Sputum cytology a poor man's bronchoscopy)	Sputum cytology, using 36 morning sputum samples.	The sensitivity of sputum cytology is 60%, and increases with the number of samples examined. The use of both sputum cytology and BAL increases the detection rate of lung cancer.

3	Davide Tosi1, Paolo Mendogni1, Rosaria Carrinola et al.	2019	CT-guided fine-needle aspiration biopsy of solitary pulmonary nodules under 15 mm in diameter: time for an afterthought?	Fine Needle Aspiration Biopsy (FNAB)	FNAB is a suitable tool for the diagnosis of pulmonary nodules of 15 mm or less in high-risk patients. Accurate patient selection, expert operator, rapid on-site evaluation and selectivity in adequacy assessment are essential to achieve high diagnostic accuracy that can avoid surgical procedures. In fact, in our series, out of 49 patients who received an adequate diagnosis. Our study showed that FNAB is an effective procedure even in the diagnosis of small pulmonary nodules. The resulting accuracy is satisfactory while both positive and negative predictive values reach the highest levels. In the era of cancer screening and targeted treatment diagnostic strategies including FNAB as the first approach for small pulmonary nodules in "sub-critical" patients should be re-evaluated.
4	Isnin Anang Marhana , Kadek Widianiti , Etty Hary Kusumastuti	2022	Conformity of Fine Needle Aspiration Biopsy (FNAB) and Core Needle Biopsy (CNB) in peripheral lung tumor patients: A cross-sectional study	Fine Needle Aspiration Biopsy (FNAB)	There was no correlation between lung tumor size and anatomical pathology findings. Anatomic pathology findings in each biopsy technique. There was no correlation between lung tumor location and anatomical pathology findings. Between lung tumor location and anatomical pathology findings in each biopsy technique. There was no correlation between tumor size, age, and number of FNAB needles passed with the incidence of each complaint. There appeared to be a significant correlation between more than two CNB needle passes and the incidence of complications. CNB can detect anatomical malignancy and specimen adequacy better than FNAB.

From the results of research conducted by Hardian et al., (2023) revealed that the sputum cytology method has the advantage of being able to assess small cell carcinoma, but large cell carcinoma lung cancer is not adequate to be assessed from sputum samples. In this study using the sputum cytology technique method using Papanicolaou and May Grunwald Giemsa staining. these have their respective advantages. Some types of lung malignancies that can often be assessed from sputum samples are squamous cell carcinoma, adenocarcinoma, and small cell carcinoma. While large cell carcinoma is inadequate to be assessed from sputum samples. [7]

In a study conducted by Ammanagi et al., (2012) revealed that sputum cytology followed by AFB as a screening regimen for high-risk groups with central lesions. Sputum cytology followed by bronchoscopy is also a practical way to detect early

stage lung cancer in these lesions. Sputum cytology is also useful in places without these facilities suggesting that for maximum diagnostic yield in the diagnosis of lung cancer, biopsy should be combined with cytology using washing and brushing. [8]

The results of Davide et al., (2019) showed that FNAB is a suitable tool for the diagnosis of lung nodules measuring 15 mm or less in high-risk patients. Accurate patient selection, expert operator, rapid on-site evaluation and selectivity in adequacy assessment are essential to achieve high diagnostic accuracy that can avoid surgical procedures. In fact, in our series, out of 49 patients who received an adequate diagnosis. Our study showed that FNAB is an effective procedure even in the diagnosis of small pulmonary nodules. The resulting accuracy is satisfactory while both positive and negative predictive values reach the highest levels. In the era of cancer screening and targeted treatment diagnostic strategies including FNAB as the first approach for small pulmonary nodules in "sub-

critical" patients should be re-evaluated.[9]

In the research of Isnin A., et al., (2022) states that there is no correlation between lung tumor size and anatomical pathology findings. Anatomical pathology findings in each biopsy technique. There is no correlation between lung tumor location and anatomical pathology findings. Between lung tumor location and anatomical pathology findings in each biopsy technique. There was no correlation between tumor size, age, and number of FNAB needles passed with the incidence of each complaint. There appeared to be a significant correlation between more than two CNB needle passes and the incidence of complications. CNB can detect anatomical malignancy and specimen adequacy better than FNAB. [10]

Overall, both FNAB and Sputum Cytology have an important role in the diagnosis of lung cancer, but they have different contexts of use. FNAB is more appropriate for localized lung cancer cases, especially in suspicious nodules or masses, as it provides more accurate and informative results. On the other hand, Sputum Cytology is more suitable for early detection in high-risk populations or as a screening method, albeit with lower accuracy. The choice between these two methods depends on the patient's clinical condition, stage of cancer, as well as the availability of existing medical facilities, with the aim of providing the most accurate diagnosis possible and selecting the most appropriate therapy.

CONCLUSION

From various studies, FNAB and sputum cytology have their respective advantages in the diagnosis of lung cancer. FNAB is highly effective for diagnosing small lung nodules, especially in high-risk patients, due to its high accuracy and ability to provide more detailed diagnostic information. In contrast, sputum cytology is more suitable for early detection and screening in high-risk populations, although its accuracy is lower and limited to certain types of cancer, such as squamous cell carcinoma and small cell carcinoma. The choice of method depends on the clinical condition, tumor location, and available medical facilities, with the aim of achieving an accurate diagnosis to support optimal therapy.

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