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Diagnostic test of thorax computed tomography scanning in lung tumors against cytopathological results at Zainoel Abidin Hospital, Banda Aceh, Indonesia period June - August 2018

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ABSTRACT

Introduction: Lung cancer which is a major cause of cancer deaths provides a perspective on the importance of the diagnosis of cancer since there is suspicion that influences the clinical diagnosis of lung cancer. Imaging modalities such as the use of contrast CT-Scan are very helpful in giving initial imaging before confirming cytopathological examination. The purpose of this study was to determine the value of the diagnostic tests possessed by CT-Scan compared to the gold standard cytopathological examination in patients with clinical diagnosis of lung cancer.

Methods: This study used a diagnostic study design with a retrospective approach at Zainoel Abidin General Hospital, Banda Aceh-Indonesia during the period June - August 2018. Analysis of diagnostic tests using cross-tabulation then calculation of sensitivity, specificity, positive predictive value (PPV), negative predictive calculations value (NPV), positive likelihood ratio (LR +), negative likelihood ratio (LR-), and accuracy were performed.

Results: Most CT-scan findings were pulmonary mass (59.3%) and the most cytopathological findings were squamous cell carcinoma (47.5%). The CT-Scan diagnostic test value compared with the gold standard cytopathological examination in the form of sensitivity, specificity, PPV, NPV, LR +, LR-, and accuracy was 75%, 30.4%, 64.4%, 50%, 0.054, 0.822 and 61% respectively.

Conclusion: Lung cancer could manifest as a wide spectrum of radiological presentations. CT-Scan provide a high sensitivity and accuracy of diagnostic in person with clinical presentation of lung cancer.

Keywords: diagnostic, value, lung cancer, imaging.

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INTRODUCTION

Lung cancer is a common cause of death in all cancers in both men and women.[1] Approximately 1.8 million new cases of lung cancer were diagnosed in 2012, with a mortality rate of 1.6 million people.[2] It is very difficult to do early detection of this cancer because cancer just shows symptoms in the advanced phase. There are several diagnostic steps to establish a patient's diagnosis of suspected lung cancer starting with history taking and physical examination.[3] Radiological examination is needed if there are no clear symptoms but there is still suspicion of lung cancer.[4]

Imaging techniques can provide qualitative and quantitative information on tumor detection, characteristics, staging, and evaluation of therapeutic responses in clinical settings. In clinical routines, the use of CT scan coupled with contrast is a preliminary investigation that must be carried out in patients with suspected lung tumors.[3] The assessment of CT scan is determined by two criteria, namely morphological criteria (margin, size, density, internal part, and characteristics around the lesion) and contrast stinging rates. The existence of different material densities that give rise to different images at the kilo electron volts (keV) level causes the use of CT-Scan to be very beneficial. Coupled with the use of contrast agents that can detect patterns from specific elements.[5,6]

In a clinical setting, a radiologist must extract from a suspicion of pulmonary nodules from a variety of images that might affect a malignancy.[4,7] Recommendations from the National Lung Trial Screening (NST), indicate that serial CT-Scan is associated with a reduction in mortality of 20%. However, screening affects potential problems such as exposure to radiation, the possibility of non-relevant findings, and over-diagnosis followed by adverse psychosocial effects. So that

recommendations if a person want to do a screening for lung cancer are done with a low dose CT-Scan Imaging.[8–10]

In clinical practice CT scan is an essential modality before a therapeutic approach is carried out before finally being confirmed using the cytopathology method. Although there have been many studies examining the diagnostic accuracy of the use of CT scans in contrast to the diagnosis of lung cancer, no similar research has been conducted at our center in Zainoel Abidin General Hospital, Banda Aceh-Indonesia. The purpose of this study was to conduct a diagnostic test on the use of contrast CT-Scan in diagnosing lung tumors at Zainoel Abidin General Hospital, Banda Aceh-Indonesia.

METHOD

Study Design

This study design using diagnostic test method of patients with lung tumors who underwent CT-scan and also confirmed through cytopathology examination. The study was conducted through a retrospective approach in between June to August 2018. All patients who went for CT-scan before initial therapy and then confirmed by cytopathology examination will be directly sampled in this study. The sample is excluded if the medical record is incomplete. The use of CT scan was performed using a CT device with the ability of 64 slices, then the contrast used was ionic contrast.

Study population

The population in this study were patients with clinical diagnosis of lung tumors who underwent CT scan and confirmed cytopathological examination. Patients with clinical sign such as tuberculosis, malignant pleural effusion, and pneumonia that are still unclear and are still suspected of a malignancy are also included in this study.

Table 1. Subject Characteristics

Characteristics	n=59
Age (years) (Mean ± SD)	53.94 ± 13.92
Gender (n, %)	
Male	44 (74.6%)
Female	15 (25.4%)
Clinical Diagnosis (n, %)	
Pleural Effusion	1 (1.7%)
Hematothorax	2 (4.3%)
Lung tumor	56 (94%)

Statistical analysis

Statistical analysis using SPSS version 25.0 for Windows software (IBM Corporation, Armonk, NY, USA). Standard procedures for diagnostic tests such as sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), positive likelihood ratio (LR +), negative likelihood ratio (LR-), and accuracy of CT scan compared to cytopathological results through cross-tabulation.

RESULT

This study is a diagnostic test involving 59 study samples that compared CT scan findings with contrast agents compared with pulmonary cytopathology results. Based on age characteristics, the average age of the sample was 58 years, male gender tended to be more than women (74.6%), and the most clinical diagnosis was lung tumor (94%) (Table 1).

The three most CT scan findings in this study were lung mass (59.3%), mediastinal mass (13.5%), and lung tuberculosis (8.4%). However, based on cytopathology findings, there are fewer confirmed 35 cytopathology pattern that lead to pulmonary malignancy (findings that are less than the results of contrast CT-Scan), where the most common types are squamous cell carcinoma (47.5%), adenocarcinoma (8.5 %), and small cell lung carcinoma (1.7%) of sample (Table 2).

Validation of the CT scan diagnosis in this case found a surprising result that the sensitivity value found was quite high at 75%, but had a low specificity value of 30.4%, then PPV, NPV, LR +, LR-, and accuracy were 64.4%, 50%, 0.054, 0.082 and 61% respectively (Table 3).

DISCUSSION

The technology of multislice CT-scan is very helpful in detecting lung tumors in clinical practice in at-risk populations. In a study by Yankelevitz et al. found that from 57,496 patients screened at the International Lung Cancer Action Program successfully detected one non-solid nodule in 4.2% of samples, one solid nodule in 30.2% of samples, and one solid part in 5% of samples.[11]

There are three types of pulmonary nodules, namely (1) pure ground-glass nodule or non-solid nodules which are usually spherical or oval with increased lung haziness accompanied by preservation of vascular and bronchial margins, (2) mixed ground glass (part-solid GGN) consist of a non-solid component that contains soft-tissue attenuation that obscures the lung parenchyma, (3) solid nodules consisting of soft-tissue attenuation associated with ground-glass opacity.[12]

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The invasive condition of adenocarcinoma can arise as a pure GGN, part-solid GGN, or solid nodules. There is a correlation between CT-scan findings on the type of cytopathology of lung cancer as found by Lederin et al.[13] that invasive adenocarcinoma with a predominant lepidic pattern tends to appear as pure or part-solid nodules with a relatively high proportion of ground-glass opacity. Under special conditions, solid components with a size of 3-5 mm are an argument to explore the possibility of invasive adenocarcinoma, then in solid components larger than 9 mm have 100% specificity for invasive pulmonary adenocarcinoma. There is linearity between the size of the nodule found in the CT-scan and the possibility of malignancy.[2]

In a study conducted by Lee et al.[14] Comparing the size of pulmonary nodules to the confirmatory cytopathological description of adenocarcinoma using 8 mm nodule size cut-off points found sensitivity, specificity, PPV, and NPV respectively 91%, 72%, 59%, and 95%. Whereas Jin et al.[15] found a difference in the results of diagnostic CT-scan findings compared to cytopathology in pulmonary adenocarcinoma with sensitivity, specificity, PPV, and NPV values of 86.3%, 61.9%, 88.7%, and 56.2%.

The existence of different findings in the value of the current diagnostic test with comparative research is indeed greatly influenced by the tools used, the technique of geometric photographs and gray levels used, and the results of radiological expertise. In this study expertise was carried out by more than one person so that this might also provide the possibility of an inter-observer bias that affected the results of expertise that existed.

Table 2. CT-Scan and Sitopathology Findings

Variable	n=59
CT-Scan findings	
Chilaiditi Syndrome	1 (1.7%)
Lung Abscess	2 (3.3%)
Lung Fibrosis with pleural effusion	2 (3.3%)
Lung mass	35 (59.3%)
Lung tuberculosis	5 (8.4%)
Mediastinal mass	8 (13.5%)
Segmental pneumoniae	4 (6.7%)
Teratoma	1 (1.7%)
Pancoast tumor	1 (1.7%)
Cytopathology findings	
Acute inflammation	9 (15.3%)
Adenocarcinoma	5 (8.5%)
Atypical smear	1 (1.7%)
Chronic granulomatous inflamation	2 (3.4%)
Chronic inflammation	5(8.5%)
Hemorrhagic Smear	1 (1.7%)
Malignant Smear	1 (1.7%)
Negative for malignancy	5 (8.5%)
Small Cell Lung Carcinoma	1 (1.7%)
Squamous Cell Carcinoma	28 (47.5%)
Teratoma	1 (1.7%)

CONCLUSION

Lung cancer could manifest as a wide spectrum of radiological presentations. CT-Scan provides high sensitivity and accuracy of diagnostic in person with clinical presentation of lung cancer. Knowledge of those specific image feature by radiologist might significantly help diagnosis of lung malignancy.

CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding publication of current article.

FUNDING

Current study doesn't receive any specific grant from government or any private sectors.

ETHICAL ASPECT

Current study has been approved by the Ethical Committee of Ethics Faculty of Medicine Universitas Syiah Kuala/Zainoel Abidin General Hospital, Banda Aceh-Indonesia.

Table 3. Diagnostic Validation of CT-Scan Compared to Histopathology Findings

CT-Scan	Cytopathology Findings		Sensitivity	Specificity	PPV	NPV	LR+	LR-	Accuracy
	Positive	Negative							
Positive	29 (64.4%)	16 (35.6%)	75%	30.4%	64.4%	50%	0.054	0.822	61%
Negative	7 (50%)	7(50%)							

PPV: positive predictive value; NPV: negative predictive value; LR^+: likelihood ratio positive; LR^-: likelihood ratio negative.

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