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Clinical Significance of Chest CT Scan for Previous Heavy Smoker

Yoshinobu KATO[1], Hiroshi BANDO[1,2,3*], Yoshikane KATO[1], Katsunori OGURA[1], Hisako YAMASHITA[1]
[1]*Kanaiso Hospital, Tokushima, Japan*
[2]*Tokushima University / Medical Research, Tokushima, Japan*
[3]*Japan Low Carbohydrate Diet Promotion Association, Kyoto, Japan*

Corresponding Author: **Hiroshi BANDO, MD, PhD, FACP** ORCID iD
Address: Tokushima University /Medical Research, Nakashowa 1-61, Tokushima 770-0943, Japan;
Email: pianomed@bronze.ocn.ne.jp

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Abstract

The patient is an 83-year-old male, who smoked 20-40 cigarettes daily during 20-75 years and quit after that. In March 2021, he revealed normal chest X-P and was explained to take chest computed tomography (CT) next year. In April 2022, chest X-P was unremarkable, but CT showed a small solid abnormal shadow in the upper left lung region nearby aortic arch and abdominal aortic aneurysm (AAA) in the upper abdomen. Almost lung cancer cases are found in current smokers or ex-smokers. Using CT, lung cancer screening shows a 20-26% decrease in cancer death. Consequently, Low-Dose CT (LDCT) for smokers would be recommended.

Keywords

Computed Tomography (CT), Abdominal Aortic Aneurysm (AAA), Lung Cancer Screening, Low-Dose CT (LDCT), Smoking

Abbreviations

CT: Computed Tomography; AAA: Abdominal Aortic Aneurysm; LDCT: Low-Dose CT

Introduction

The worldwide statistics of cancer were reported by the International Agency for Research on Cancer (IARC) in the year 2020 [1]. The data were collected from 185 countries or districts. New cancer cases were estimated to be 19.3 million, and about 10.0 million cancer deaths were found in 2020. The most commonly diagnosed cancers included female breast cancer (2.26 million), lung cancer (2.21 million), and prostate cancer (1.41 million). The highest causes of actual death included lung (1.79 million), liver (0.8 million), and stomach (0.77 million) [1].

For some decades, the rapid development of imaging technology has brought benefits to the early detection of diseases. In particular, computed tomography (CT) scans have contributed much to the screening of lung cancer [2]. Lung cancer cases were found to be about 1.8 million cases of the fatal disease in 2020. It has been mainly observed in heavy smokers and/or ex-smokers [1]. If low-dose computed tomography (LDCT) screening methods could be adequately conducted for smokers, the reduction ratio would be about 20% in comparison with the control group [3]. The relationship between benefit and risk is important for health effects and radiation risk. From this perspective, the fact would be considered that the incident of lung cancer is rather rare for many

participants, and the radiation risk is given to all cases who take the exam [4].

Among them, about 85% of lung cancer cases are current smokers or ex-smokers [5]. According to Detection of lung cancer through low-dose CT screening (NELSON) trial, mortality was decreased by 26 % (9-41%, 95% CI) for asymptomatic men with high risk [6]. In the case of female cases, the rate-ratio of death from lung cancer was 0.73 for 10 years. It suggested larger efficacy for lung cancer compared with men [7].

The authors have been engaged in general medical care/cure and health check-up for years [8]. During clinical practice, we have taken appropriate measures according to the pathology and background of each patient [9]. Currently, we have experienced an elderly case, who was a heavy smoker and quit smoking for years. He took a chest X-ray in 2021 with an unremarkable finding and was told to plan a chest CT scan next year. In April 2022, he was detected to have an abnormal shadow in the left lung by CT. In this article, we will describe his general progress and some perspectives.

Case Presentation

Medical History:

The patient is an 83-year-old male. For medical history, he had no particular illness for long. He had been smoking 20-40 cigarettes daily from 20 years old. When he was 75, he was hospitalized for pneumonia. This triggered him to quit smoking, and he hasn't smoked since then. His hypertension was pointed out five years ago with a mild degree, and he took amlodipine besylate 2.5mg for two years. After that, he has not had medication for two years.

In March 2021, he came to our hospital associated with symptoms of a cold. He took a chest X-ray because he hadn't checked his chest X-ray for several years. Although there were no particular abnormal findings, we explained that a chest X-ray would be necessary every year and a chest CT would be necessary every two years because he was a heavy smoker.

After a one-year interval, he visited our hospital complaining of a slight cough and sputum. He did not develop fever or other symptoms. According to his situation and our explanation in the medical chart for 2021, we ordered a chest X-ray and CT scan.

Physical & Laboratory Examination:

His physical examination in April 2022 revealed unremarkable abnormality of vital signs, consciousness, heart, lung, abdomen, and neurological findings. His physique showed 168cm, 55.3 kg, and BMI 19.6 kg/m^2. ECG revealed ordinal sinus rhythm (OSR), pulse 72/min, regular, and no specific ST-T changes.

Biochemical laboratory tests were conducted in Dec 2021 by regular health check-up. The results were as follows: Cr 0.88 mg/dL, eGFR 63.0 L/min/1.73m^2, uric acid 5.5 mg/dL, TG 92 mg/dL, HDL 56 mg/dL, LDL 95 mg/dL, AST 22 U/L, ALT 14 U/L, r-GTP 30 U/L, RBC 4.70 x 10^6 /μL, Hb 14.2 g/dL, Ht 44.2%, glucose 88 mg/dL and HbA1c 5.8%.

Results

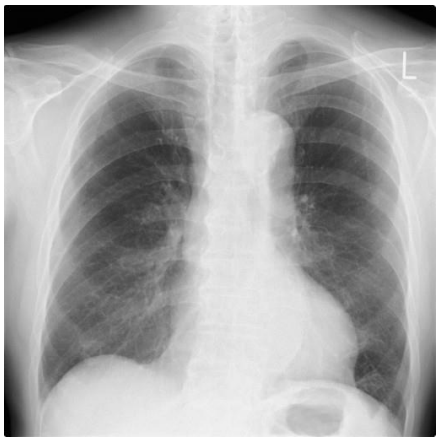
A radiological examination was conducted for him. Chest X-ray in March 2021 showed normal (**Fig-1A**). Furthermore, a chest X-ray in April 2022 would not show remarkably significant abnormal findings in both lungs (**Fig-1B**). However, a chest CT scan detected an irregular-shaped solid shadow in the upper left lung, which is situated nearby the aortic arch (**Fig-2A, Fig-2B, and Fig-2C**). Furthermore, the chest CT could cover the upper abdomen area, where an abdominal aortic aneurysm (AAA) was detected with 60mm in diameter (**Fig-2D**). All images are in suitable condition for lung investigation. From the current situation, he is required to have a detailed investigation for probable lung cancer and also AAA. He was transferred to Tokushima Red Cross Hospital (RCH) for further evaluation and treatment, including adequate medical judgment for the predominance management of two problems.

Ethical Considerations

This study has been fundamentally performed according to the Declaration of Helsinki from an ethical point of view. In addition, some comments

Case Report

1A)



1B)

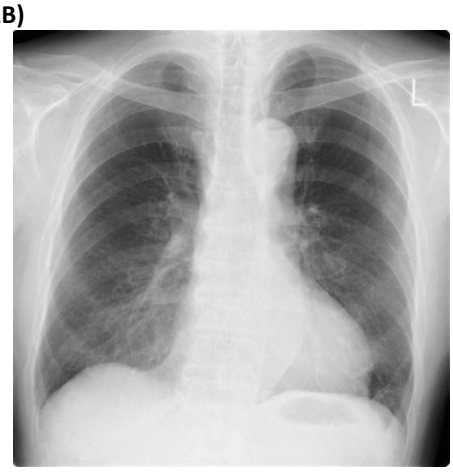
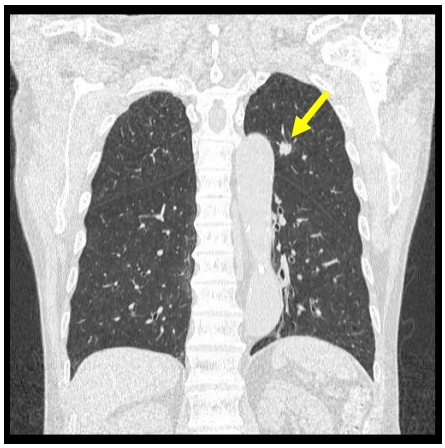
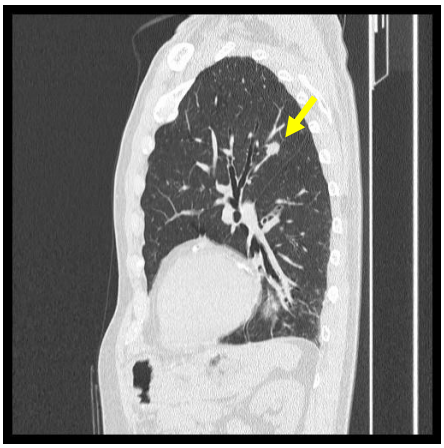


Fig-1: Chest X-ray in March 2021 and April 2022
1A: normal findings in March 2021
1B: unremarkable findings detected in April 2022

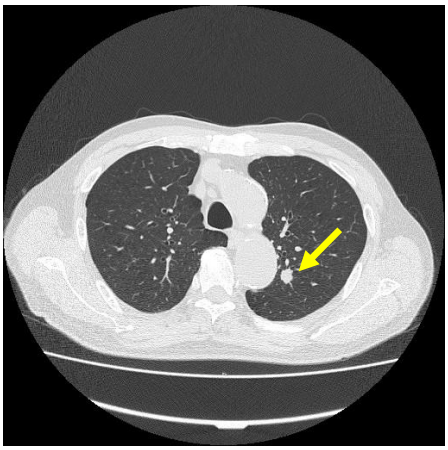
2A)



2B)



2C)



2D)

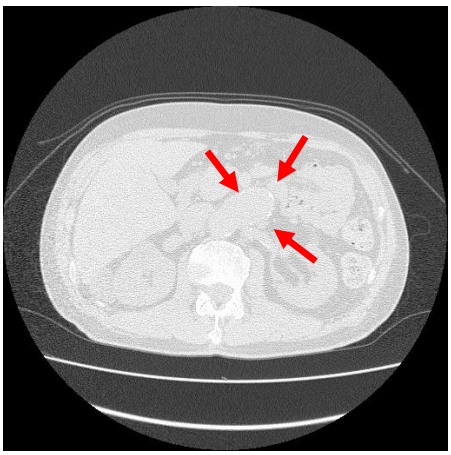


Fig-2: Chest CT scan findings in April 2022
2A: Coronal view shows solid lesion in left upper lung
2B: Sagittal view shows solid lesion in left posterior lung
2C: Axial view shows solid lesion in the dorsal side of left lung
2D: Abdominal view shows abdominal aorta aneurysm (AAA)
(All CT images are suitable condition for lung investigation.)

were made along with the Ethical Guidelines for Research for Humans. This situation has been associated with Good Clinical Practice (GCP). Authors and co-researchers related to the current report have set up an ethical committee. It consists of several professional members, such as the director, physician, surgeon, nurse, dietician, pharmacist, and legal specialty. We have discussed enough time for this matter accompanied by the agreements for this study protocol. The informed consent and written agreement document were obtained from the patient.

Discussion

Lung cancer across the world has been a large burden. The International Agency for Research on Cancer (IARC) announced the new cases of lung cancer as more than 2 million. It is equivalent to 11.9% of total cancers, and lung cancer mortality would be about 1.8 million, which is 18.4% of total cancer death [10]. Lung cancer has been one of the main causes of various cancer deaths across the world [3]. For screening methods for lung cancer in smokers, low-dose computed tomography (LDCT) has been known for years. Concerning RCT investigations for LDCT, a recent report was found. It included several aspects such as radiological procedures, changed smoking behavior, quality of life, and clinical effectiveness. The investigation was from 10 RCTs with 43 papers. The results showed a significant decrease in mortality from lung cancer by 12% (risk ratio, RR 0.88). LDCT scans seemed to be positive for 4-24%; the ratio of false positives was 84-96%, and the overdiagnosis risk was 19-69% for the diagnosis of lung cancer [3].

LDCT screening strategy has been evaluated to have a significant reduction in lung cancer mortality for heavy smokers and ex-smokers [11]. The ratio would be approximately 20% lower than control cases who did not attend the LDCT program. When current smokers and ex-smokers aged 50-75 years receive annual LDCT, the estimation of radiation-related risk for developing cancer would be 0.1% for men and <0.25% for females. On the other hand, the mortality reduction benefit would be approximately 20% for lung cancer. Consequently, LDCT screening shows a benefit-risk ratio of 25 times for men and 10 times for females [11].

In the current patient, he was fortunately provided the opportunity to be checked by chest CT. For a long time, the influence of smoking has been widely known for keeping the health of many people. From this perspective, lung cancer screening (LCS) can reduce the mortality rate of individuals at risk for smoking-related lung cancer [12].

For cancer development, the influence of cessation, reduction, and resumption on smoking was studied [13]. The protocol included about 893 thousand cases of smokers who quit, reduced, sustained, or increased smoking. Among various results, quitters showed a lower adjusted hazard ratio (aHR), where all cancers (0.94), smoking-related cancers (0.91), and lung cancer (0.79). In contrast, smokers of resumption showed increased aHR compared with sustained quitting, where smoking-related cancer (1.19) and lung cancer (1.48) [13]).

From lung cancer screening, the decision of eligibility for people would be important. The electronic health record (HER) becomes an improving risk factor for lung cancer [14]. Associated with clinic-related initiatives, system-level prioritization may decrease risk levels for documentation rates. The Cancer Intervention and Surveillance Modeling Network (CISNET) models show predictions for death from lung cancer related to age and smoking history [15]. As a result, the percentage of death risk from cancer/year was 6.16×10^{-2} during 55-80 years old. This model would be elevated associated with age, quitting age, and the smoking amount and be decreased with a delayed starting age of smoking.

In summary, a case report associated with the clinical significance of lung cancer screening using a CT scan was described in this article. This report will hopefully contribute to some degree to daily actual practice in various situations.

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Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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