

# 香川県立保健医療大学リポジトリ

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# Pulmonary Emphysema on CT Screening for Lung Cancer

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## Abstract

Recently, chest CT has been used to screening for lung cancer. To determine the incidence of pulmonary emphysema (PE) and its severity identified by computed tomography (CT) screening for lung cancer.

We reviewed 2,731 cases (1,890 men and 841 women, ranging in age from 21-91 years) who underwent CT scanning. CT findings were judged abnormal if there were areas of low attenuation. Among the men, there were 1,592 smokers including ex-smokers and 298 non-smokers. On the other hand, there were 114 female smokers including ex-smokers, and 727 non-smokers. CT findings were classified into normal and four grades (1-4); grade 1, mild, to grade 4, severe.

PE was found in 827 of 1,592 (51.9%) male smokers and in 6 of 298 (2.0%) non-smokers. Among women, PE was found in 27 of 114 (23.7%) smokers and in 10 of 727 (1.4%) non-smokers.

PE is related to smoking and progresses with age and cumulative cigarette smoking dose, from 29.6% in age group less than 30 years to 65.7% in age group of over 70's. PE was found in more than half of male smokers on average, if the severity of PE is ignored.

**Key Words:** pulmonary emphysema, CT screening, lung cancer, smoking

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## Objectives

To determine the incidence of pulmonary emphysema (PE) and its severity identified by computed tomography (CT) screening for lung cancer.

## Materials and Methods

We reviewed 2,731 cases (1,890 men and 841 women, ranging in age from 21-91 years) who underwent CT scanning. CT findings were judged abnormal if there were areas of low attenuation. Among the men, there were 1,592 smokers including ex-smokers and 298 non-smokers. On the other hand, there were 114 female smokers including ex-smokers, and 727 non-smokers.

CT findings were classified into normal and four grades (1-4) ; grade 1, mild, to grade 4, severe<sup>1</sup>. In all cases, contiguous 1-cm sections encompassed the entire thorax without using high-resolution reconstruction.

## Results

PE were divided to two subtypes: centrilobular emphysema (Fig.1 a-c) and paraseptal emphysema (Fig. 2 a-c). Centrilobular emphysema is by far the most common form of emphysema and has a proven association with cigarette smoking. Paraseptal emphysema can occur as an isolated phenomenon in young adults. Bullae can develop in association with any type of PE but are most common with paraseptal emphysema or centrilobular emphysema.

PE was found in 827 of 1,592 (51.9%) male smokers and in 6 of 298 (2.0%) non-smokers. Among male smokers, the prevalence of PE by grade was: grade 1, n=383; grade 2, n=206; grade 3, n=154 and grade 4, n=84 (Fig. 3).

The incidence of PE in men in each age group: less than 30 years, n= 8 (of 27, 29.6%) ; 30's, n=33 (of 90, 36.7%), 40's, n= 138 (of 294, 46.9%) ; 50's, n=241 (of 507, 47.6%) ; 60's, 231 (of 406, 56.9%) ; and 70's, n=176 (of 268, 65.7%) (Fig. 4).

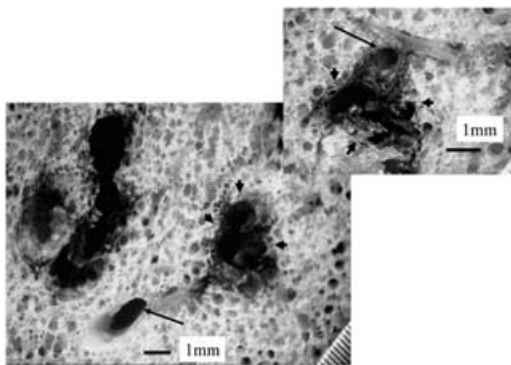


Figure1-a

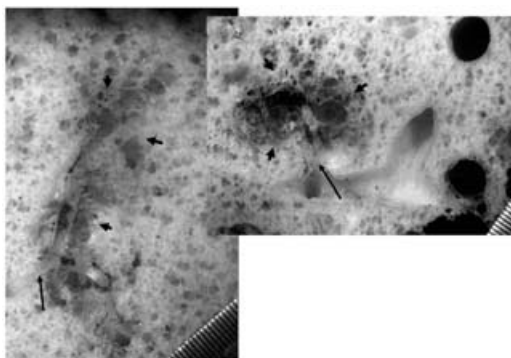


Figure1-b

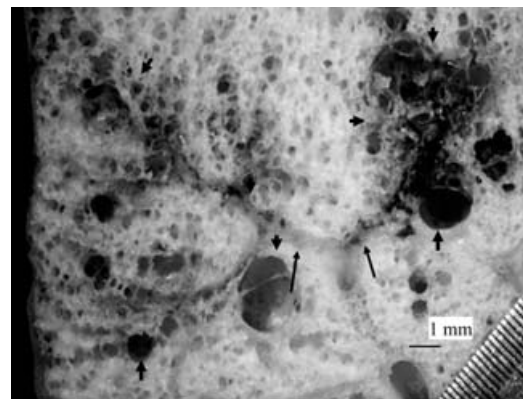


Figure1-c

Figure 1 Three cases of centrilobular emphysema: Figure 1-a, Figure 1-b, Figure 1-c  
Arrow(short) : Lesions of emphysema  
Arrow(long) : Terminal bronchiole

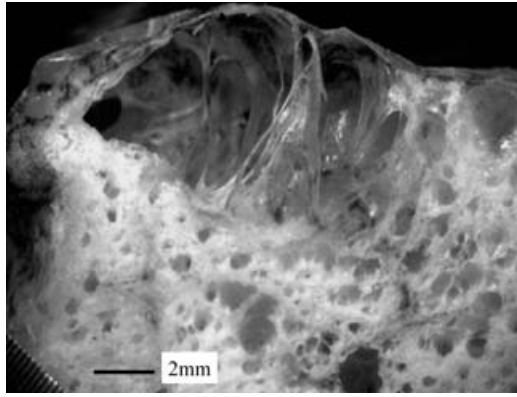


Figure2-a

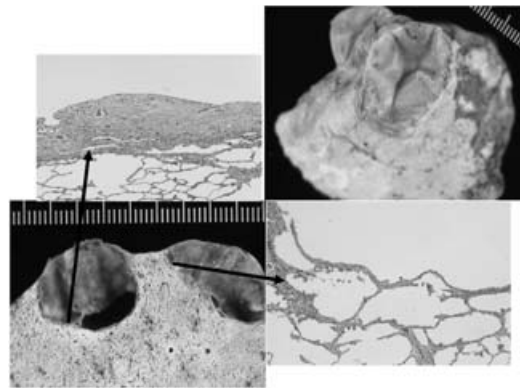


Figure2-c

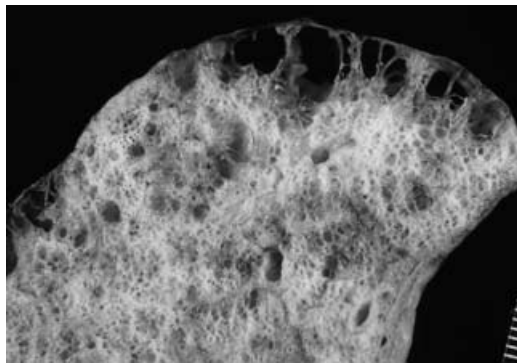


Figure2-b

Figure 2 Three cases of paraseptal emphysema; Figure 2-a, Figure 2-b, Figure 2-c  
Figure 2-c The part of bullous wall is continued to the normal alveoli.

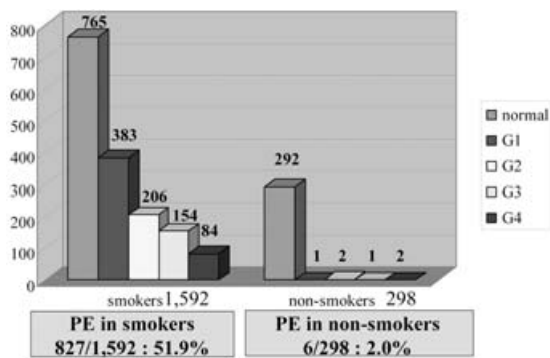


Figure 3 Incidence of pulmonary emphysema in male smokers (n=1,890)

The severity of pulmonary emphysema (PE) on CT is shown from grade (G) 1, mild, to G 4, severe.

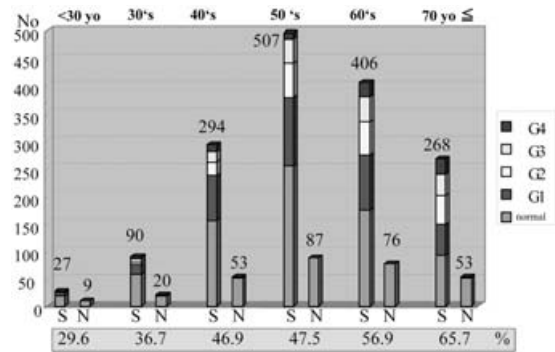


Figure 4 Incidence of pulmonary emphysema in male smokers depends on age group. Severity of PE is same as in Figure 3.  
S: smokers N: non-smokers

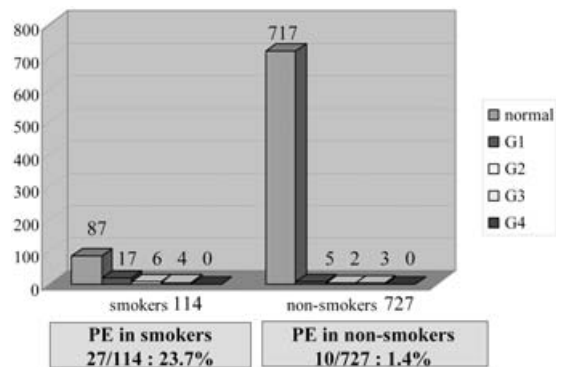


Figure 5 Incidence of pulmonary emphysema in female smokers (n=841). Severity of PE is same as in Figure 3.

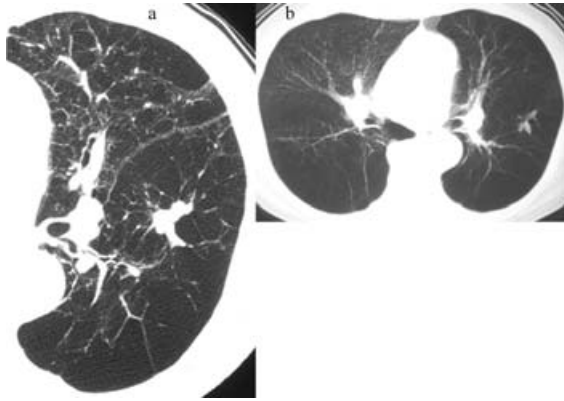


Figure 6 Adenocarcinoma with pulmonary emphysema in a 72-year-old male.

Figure 6-a : High-resolution CT. Irregularly shaped cancer lesion is seen between cystic lesions of pulmonary emphysema in anterior segment (S<sup>8</sup>) of the left lower lobe.

Figure 6-b. Conventional CT. The nodule is difficult to diagnose as lung cancer.

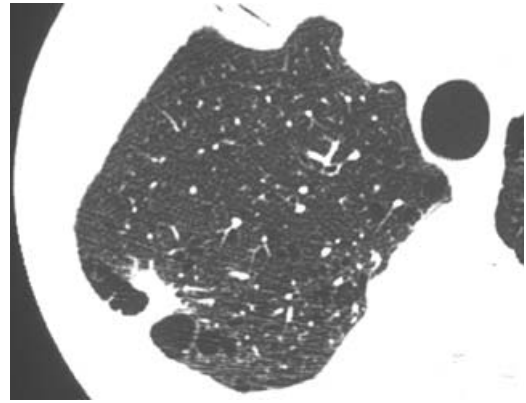


Figure 7 Adenocarcinoma with pulmonary emphysema in 49-year-old man.

The lesion resembles a mushroom due to pulmonary emphysema on both sides.

Among women, PE was found in 27 of 114 (23.7%) smokers and in 10 of 727 (1.4%) non-smokers. The prevalence of PE by grade was: grade 1, n=17; grade 2, n= 6 ; grade 3, n=4 and grade 4, n= 0 (Fig. 5).

There were no statistically significant differences in cigarette consumption in number of pack-years according to CT grade.

## Materials and Methods

Previous studies concerned with PE detection included mostly older subjects based on pulmonary function tests and may not reflect the true incidence of PE in the general population. Using CT scanning, PE can be found in young subjects even in those under age 30 years. Although PE can occur in nonsmokers, PE is strongly related to smoking and progresses with age and cumulative cigarette smoking dose. PE was found in more than half of male smokers on average. Incidentally, one of important clinical points in PE is complication with lung cancer, in those cases diagnosis as lung cancer is sometimes difficult (Fig. 6, 7).

## Reference

- 1) Satoh K, Kobayashi T, Misao T, Hitani Y, Yamamoto Y, Nishiyama Y, et al: CT assessment of subtypes of pulmonary emphysema in smokers. *Chest* 120: 725-729. 2001.

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## 要旨

近年肺癌検診をCTで施行する施設が増加している。そのCT画像を利用して肺気腫の発生頻度と重症度を検討した。

CT検診を受診した2,731例（男性1,890例, 女性841例, 年齢21~91歳）を対象とした。CT所見は肺野の低吸収域を認めた場合を肺気腫と判定した。

男性では喫煙者が過去喫煙者を含め1,592例, 非喫煙者は298例であった。一方女性では喫煙者が114例, 非喫煙者は727例であった。CT所見は正常と, 軽症の grade 1 から重症の grade 4 までの5段階とした。肺気腫の発症は男性では喫煙者の51.9%, 非喫煙者の2.0%で認められ, 一方女性では喫煙者の23.7%, 非喫煙者の1.4%で認められた。男性の年齢階層別の肺気腫発症では30歳未満での29.6%から70歳以上での65.7%まで次第に上昇していた。

肺気腫は喫煙者で若年から発症し, 喫煙を持続することで進行することが考えられた。症状のない軽度の肺気腫を考えると男性喫煙者の半数以上に認められた。

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