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Effect of cannabis and tobacco on emphysema in patients with spontaneous pneumothorax

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KEYWORDS
Spontaneous pneumothorax;
Tobacco consumption;
Cannabis;
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Compute tomography (CT)

Abstract
Purpose: To compare imaging findings on thoracic computed tomography (CT) examination in patients with primary spontaneous pneumothorax (SP), depending on their tobacco and/or cannabis consumption.
Materials and methods: A total of 83 patients who had thoracic CT for primary SP were prospectively included. There were 65 men and 18 women with a median age of 33 years (IQR: 27; 44 years). The patients were further categorized into three groups according to their smoking habits. Thirteen patients were non-smokers, 38 were tobacco only smokers and 32 were tobacco and cannabis smokers. CT examinations were retrospectively reviewed for the presence of blebs, centrilobular and paraseptal emphysema and lung nodules in each group for comparison.
Results: Emphysema was detected in 43/85 patients (51.8%), including 1/13 patients (7.7%) in the non-smoking group, 19/38 patients (50%) in the tobacco only group and 23/32 patients (71.9%) in the tobacco and cannabis smokers, with no difference between tobacco only and tobacco and cannabis smokers. No differences in type and location of emphysema was found between tobacco only and tobacco and cannabis smokers. Tobacco and cannabis smokers with emphysema were significantly younger than tobacco only smokers with emphysema (35 vs. 46 years, respectively) ($P = 0.009$).

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Conclusion: The prevalence of emphysema visible on CT is not different between tobacco and tobacco/cannabis smokers, however, it occurs at a younger age in tobacco and cannabis smokers. This result suggests that cannabis, when added to tobacco, may lead to emphysema at a younger age.

Pneumothorax is classified as being spontaneous, traumatic, or iatrogenic. A primary spontaneous pneumothorax (SP) occurs in patients without clinically apparent lung disease, whereas a secondary SP is a complication of a preexisting lung disease [1]. A SP is a common disease in young adults, with an incidence of 7.4—18 cases per 100 000 persons in men and 1.2—6 cases in women [1,2]. Etiologies of SP are not well known. Risk was reported to increase with body size; this may explain the male predominance in primary SP [3]. Subpleural bullae are common, but are not correlated with the occurrence or recurrence of an SP [4]. The role of atmospheric pressure variation in developing SP has been suggested [5].

Tobacco smoking increases the risk of SP by reaching a relative risk of 20 in a dose-dependent manner [2]. However, it is still unclear how tobacco smoking promotes the development of SP. Among smokers, pneumothorax is associated with an increased percentage of total and subpleural emphysema [6]. It may also induce pulmonary lesions, such as respiratory bronchiolitis, which may increase the risk of an SP. Several studies reported a high incidence, up to 90%, of respiratory bronchiolitis in smokers with an SP [7]. These peripheral airway lesions may be the precursor of more severe anatomical lesions, such as centrilobular emphysema.

In contrast to the well-described effects of tobacco smoking on pulmonary emphysema and SP, the effects of cannabis smoking have not been described yet. Several studies [8—10] have shown a dose response relationship between cannabis smoking and COPD, though the relationship to an SP is less well described [11].

However, cannabis is the most commonly smoked illicit substance in many countries. According to the World Health Organization (WHO), about 147 million people or 2.5% of the world's population consume cannabis [12]. In the European Union, cannabis use is relatively common, with around 23.5 million people having used the drug in the past year and about 17.1 million (13.9%) of the young adults (15—34 years) [13]. In France, 6.3% of people aged between 18 and 25 years report a regular cannabis abuse [14]. About 25% of last-month cannabis users were daily or almost daily users of the substance [14]. Impact of cannabis smoking on the lungs is probably underestimated. Cannabis can be smoked alone in plain form (marijuana), but in France it is mainly smoked in the form of cannabis resin mixed with tobacco [14]. Consequently, it is difficult to estimate the toxicity of cannabis alone. However, cannabis and tobacco may have additional toxicities. The aim of this study was to compare thoracic computed tomography (CT) findings in patients referred for thoracic CT after a spontaneous pneumothorax (SP), depending on their tobacco and/or cannabis consumption status in a French prospective cohort.

Patients and methods

Patients

The study protocol was approved by the Institutional Review Board of the French Society of Thoracic and Cardiovascular Surgery (CERC-SFCTCV-2016-8-8-22-26-27-GoVa).

''SOS pneumothorax'' of Tenon University Hospital is a tertiary referral unit for pneumothorax. All data of patients referred to the SOS pneumothorax unit between 01/01/2012 and 31/5/2013 were recorded in a local prospective database. CT examinations were performed from January 2012—January 2013 (Period 1) in patients older than 40 years, with active tobacco abuse of more than 15 pack-year (PY), or in those with an abnormal chest radiography and from February—May 2013 (Period 2) systematically on patients with SP to detect a secondary pneumothorax. Patients were included in this retrospective evaluation if they underwent CT after a SP. Only primary SP were considered, pneumothoraces secondary to a lung disease, with exception of emphysema, were excluded.

Clinical assessment

For each patient, the following characteristics were analyzed: age, gender, weight, height, body mass index (BMI), personal and family histories of pneumothorax, type of pneumothorax, as well as pneumothorax treatment. Tobacco and cannabis consumption were assessed at hospital arrival and were respectively quantified in PY and joint-years (JY). One JY corresponds to the cumulative smoking of 1 joint per day for one year.

Thoracic computed tomography (CT) protocol

CT acquisition protocol: unenhanced CT-scan acquisition of the whole thorax was performed on 64-detector CT units from 2 vendors (Philips Brillance® 64; GEMS HD 750, Philips, Eindhoven, The Netherlands), with the following parameters: 120 kV, auto-exposure with 1 mm collimation, pitch 1,

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