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Early View

Research letter

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ERJ Research Letter

REVISED VERSION

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AN IMPORTED CASE OF E-CIGARETTE OR VAPING ASSOCIATED LUNG INJURY (EVALI) IN BARCELONA

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Very recently Layden *et al* published the first series of 53 patients with acute lung injury associated with the use of e-cigarettes (also known as vaping) in Wisconsin and Illinois (USA) [1]. To our knowledge, only a few cases of e-cigarette, or vaping, associated lung injury (EVALI) have been reported outside the USA (in Canada and Japan) and, so far, none in Europe [2]. Here we present the case of a 31-year-old woman who lived Chicago (Illinois, USA) and arrived in Barcelona (Spain) on vacation from on September 17, 2019 and, as detailed below, suffered EVALI. To our knowledge, this is the first case of EVALI reported in Europe and, given the current world globalization that allows individuals to travel to other countries easily, highlights the need of being aware of the possibility of encountering, thus diagnosing and treating, a case of vaping-induced acute lung injury outside the US.

The past medical history of the patient was unremarkable. She had been vaping nicotine daily for the last 3 months but, during the last week, she used nicotine salts using the same device. She attended the emergency room of Hospital Clinic in Barcelona (Spain) after a 72-hour history of fever, myalgia, dry cough, dyspnea, and fatigue. On admission, temperature was 38.5°C, respiratory rate 26/minute, heart 110 rate bpm, and left crackles were audible on thoracic auscultation. Chest X-ray showed left lower alveolar infiltrates. Arterial blood gases breathing 24% O_2 showed PaO_2 44 mmHg, $PaCO_2$ 34 mmHg and pH 7.33. Leukocyte count was 11.8×10^9/L (88% polymorphonuclear cells) and C-reactive protein levels 17 mg/dL (normal < 1mg/dL). Kidney and liver function were normal, and urine antigen testing *for Streptococcus* and *Legionella*, blood culture, and HIV serology were all negative. Following an initial diagnose of community acquired pneumonia, treatment with ceftriaxone (2g daily), azithromycin (500mg daily) and methylprednisolone (40mg daily) was initiated. Yet, 72

hours later, her clinical condition had deteriorated, and radiological chest infiltrates had worsened. A computed-tomography chest scan (Figure 1) showed bilateral lower lobe consolidation with air bronchograms, pleural effusion and peri-bronchial ground glass opacities in the upper and medium right lung. Pleural fluid characteristics were protein levels 17g/L, pH 7.86, glucose 160 mg/dl, lactate dehydrogenase (LDH) 219 UI/l, and neutrophil predominance (60%); bacterial culture was negative. Bronchoalveolar lavage fluid (BALF) showed lipid laden macrophages (55%), lymphocytes (28%) and neutrophils (17%). BALF culture and polymerase-chain-reaction assay for bacterial, fungal, and viral pathogens was negative. Considering the possibility of vaping-induced lung injury, methylprednisolone doses were increased to 40 mg every 12 hours. During the next 7 days, her clinical condition improved progressively with complete resolution of radiographic opacities. Twelve days after hospitalization, the patient could be discharged home without supplemental oxygen and progressive tapering of oral prednisone. A few days later, the patient flew back to Chicago (USA) uneventfully.

This clinical case fulfils all the diagnostic criteria proposed by the CDC for EVALI [1], namely: *(1)* use of an e-cigarette (vaping) in 90 days before symptom onset; *(2)* pulmonary infiltrate (e.g. ground-glass opacities on chest CT (Figure 1) [3]; and, *(3)* absence of pulmonary infection (i.e., negative respiratory viral panel, urine antigen testing for Streptococcus pneumoniae and legionella, sputum, BALF or blood culture, and absence of HIV presence) or alternative plausible diagnoses (e.g., cardiac, rheumatologic, or neoplastic process). The presence of lipid laden macrophages in BALF [4] is likely a marker of vaping but not a criteria for the diagnosis of EVALI. The clinical presentation of this patient is similar to those reported previously, albeit pleural effusion is unusual [1].

To our knowledge, this is the first case of EVALI reported in Europe. This contrasts with the recent epidemic seen in the US [1]. As of October 22, 2019, 1,604 cases of EVALI have been reported to CDC, and thirty-four deaths have been confirmed. E-cigarettes are also widely used in Europe too, both for leisure and as a quitting-smoking strategy. For instance e-cigarettes have now become the most common quitting aid for smokers in England [5]. Reasons for this geographical discrepancy are unclear but may relate to the fact that many, but not all, of reported cases have been associated with vaping of cannabinoid-containing products and not simply nicotine [1, 6]. Yet, due to the wide diversity and unregulated nature of vaping devices, products, and practice habits among users, the specific chemical compounds directly causing lung damage remain obscure in many cases [6]. Actually, the patient reported here vaped “freebase” nicotine daily for the last 3 months, which is the nicotine form ordinarily used in e-liquids. However, she had used nicotine salts during the last week, which are formed by the reaction of nicotine with suitable acid that are less volatile than freebase nicotine [7]. It is possible that the use of nicotine salts might have cause EVALI albeit very recent reports suggest that vitamin E acetate may cause it [8].

In summary, this first case of EVALI in Europe further support the potential harmful effects of e-cigarettes and alert clinicians outside the US about this, likely raising, treatable condition.

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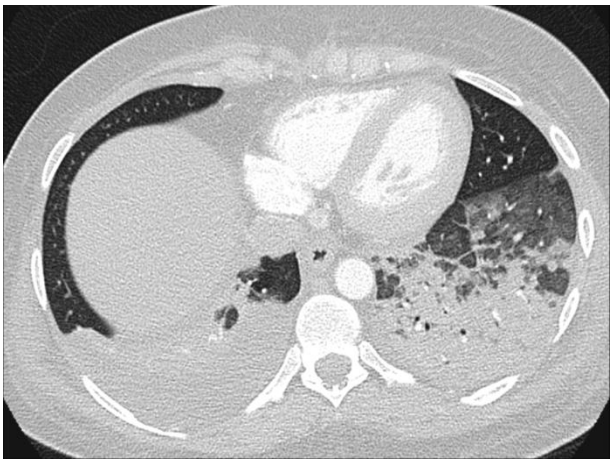
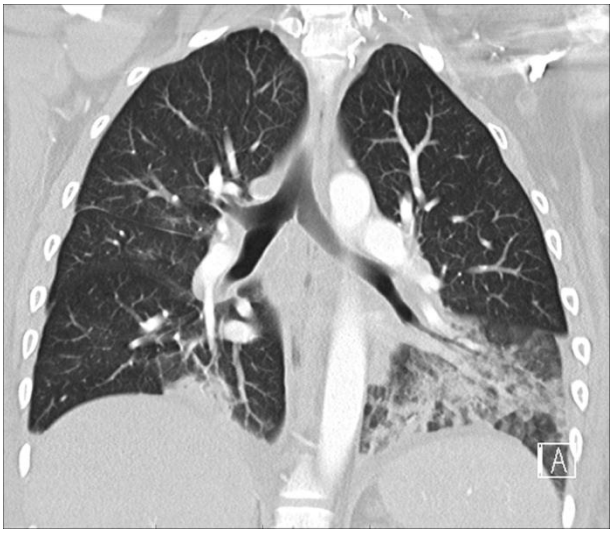
FIGURE LEGEND

Figure 1. Thoracic CT with iv contrast. Axial image (a) and coronal reformation (b) showing small right pleural effusion and bilateral foci of ground glass and consolidation with peri-bronchovascular, peri-lobular and lobar distribution.

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