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Acute Eosinophilic Pneumonia Associated with E-Cigarettes: A Case Report

Elektronik Sigaraya Bağlı Akut Eozinofilik Pnömoni: Olgu Sunumu

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Abstract

Knowledge of the detrimental effects of electronic cigarettes on the lungs is increasing, especially in young adults and those who are trying to quit smoking. The lung damage caused by E-cigarettes has become known as "Electronic cigarette-associated lung injury (EVALI)" and is thought to be attributable to Vitamin E Acetate and Tetrahydrocannabinol. A female patient with no known chronic disease presented with complaints of dry cough and shortness of breath for 2 weeks. Bronchoscopy was performed on the patient, whose complaints and in-lung infiltrations were noted to increase under antibiotic treatment. Broncho-alveolar lavage (BAL) cell count showed 80% eosinophils. After 4 weeks of vaping, the patient was diagnosed with acute eosinophilic pneumonia (AEP) that was attributed to vaping. Cases of eosinophilic pneumonia, lipoid pneumonia and organizing pneumonia associated with E-cigarette use have been reported. Our patient was diagnosed with eosinophilic pneumonia associated with E-cigarette use, and we believe the specific characteristics of the case merit consideration in the body of related literature.

Keywords: *Electronic cigarette, vaping, acute eosinophilic pneumonia, EVALI.*

Öz

Özellikle genç erişkinlerde ve sigara bırakmaya çalışanlarda kullanımı yaygınlaşan 'Elektronik Sigara'nın akciğere zararları gün geçtikçe daha fazla gözlenmektedir. Elektronik sigaranın neden olduğu akciğer hasarına 'Elektronik sigara ilişkili akciğer hasarı(EVALI)' denilmektedir. Elektronik sigaranın zararlarının, Vitamin E Asetat ve Tetrahidrokannabinol'e bağlı olduğu düşünülmektedir. Bilinen kronik hastalığı olmayan kadın hasta, tarafımıza 2 haftadır olan kuru öksürük ve nefes darlığı şikayetleriyle başvurdu. Antibiyotik tedavisi altında şikayetleri ve akciğerdeki infiltrasyonları artış gösteren hastaya bronkoskopisi yapıldı. Bronko alveolar lavaj (BAL) hücre sayımında ise %80 eozinofil saptandı. Dört haftadır elektronik sigara kullandığı öğrenilen hastaya elektronik sigaraya bağlı akut eozinofilik pnömoni tanısı konuldu. Elektronik sigaraya bağlı eozinofilik pnömoni, lipoid pnömoni, organize pnömoni gibi olgular bildirilmiştir. Biz bu olguda elektronik sigaraya bağlı eozinofilik pnömoni tanısını koyduk. Olgumuzun literatüre katkı sağlayacağı düşünüldü.

Anahtar Kelimeler: *Elektronik sigara, akut eozinofilik pnömoni, akciğer hasarı.*

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The popularity and use of E-cigarettes are increasing worldwide with each passing day. While some people have taken to E-cigarettes as an alternative to smoking and as an aid to quitting smoking, their use among young people and those who are not smokers has also increased. In 2010, some 1.8% of U.S. adults reported using E-cigarettes at some time, and this figure had risen to 13.0% by 2013, while reports of "current use" increased from 0.3% to 6.8% in the same period (1).

Different models of E-cigarettes have been produced in recent years to meet the increase in demand, although all comprise five main components: the battery, cartridge, microchip, sprayer and body. The operating principle is based on the microchip effect of the liquid, which consists of propylene glycol, preferably nicotine or cannabinoids, formed by propylene glycol in the cartridge, and is triggered by the flow of air inhaled to the lungs, resulting in the battery creating a cigarette-like effect (2). Although it is considered an alternative to smoking in terms of reliability, a study released by the FDA has reported a link between the propylene glycol used in E-cigarettes and carcinogenesis. Furthermore, previous studies have reported that E-cigarettes can trigger infectious and noninfectious inflammatory lung diseases (2). When E-cigarette-related lung diseases are reviewed together with case series in the literature, certain patterns are revealed, including diffuse alveolar damage, organizing pneumonia, lipoid pneumonia, hypersensitivity pneumonia, bronchiolitis and acute eosinophilic pneumonia (3). There have been two cases of eosinophilic pneumonia resulting from the use of E-cigarettes reported to date in literature (4,5). The present study relates to a case that was diagnosed with eosinophilic pneumonia caused by E-cigarettes and was admitted to our clinic.

CASE

A 55-year-old female patient with no known disease history presented to the clinic with shortness of breath and a dry cough that had lasted for 2 weeks. The patient had a 30-packs/year smoking history but had switched to E-cigarettes around 2 months earlier. The findings of a physical examination were as follows: temperature 36.7°C, pulse: 80/min, respiratory count: 22/min and blood pressure arterial: 110/70 mmHg. The patient had no cyanosis, but bilateral common rales in the upper zones and in the left middle zone, as well as bilateral diffuse bronchi, while all other system examinations were unremarkable. Her medical history revealed pneumonia 8 months earlier for which she was hospitalized. A posteroanterior (PA) chest X-ray revealed bilaterally-dispersed infiltration, based on which she was admitted with a preliminary diagnosis of pneumonia and started on intravenous moxifloxacin treatment. Leukocyte levels (9040 mL) were normal in the hemogram, 24.4% eosinophilia was detected, CRP was 1.35 mg/dL and her biochemistry was normal. Nodular-shaped focal consolidations and blurry glass densities, accompanied by interstitial thickening, were observed in both lung parenchyma, especially in the upper lobes and peripheral lung tissue, and partially observed in the lower lobes on a Thoracic CT scan (Figure 1). The following values were recorded following a respiratory function test: FVC: 3510 mL 109%, FEV_1: 2740 mL 100% FEV_1/FVC: 78%, DLCO: 5.17 61% DLCO/VA: 0.96 62%. No endoparasites were detected in a fecal parasite examination, and cANCA and pANCA results came back negative. In a broncho alveolar lavage (BAL). the BAL culture remained sterile and 80% eosinophil was detected in the BAL cell count. The patient was planned for treatment with 32 mg methylprednisolone based on an acute eosinophilic pneumonia diagnosis. When the patient was questioned again, it was learned that she had started using JUUL E-cigarettes 4 weeks earlier. An improvement in symptoms was noted, and a physical examination in the 1st month control under corticosteroid therapy revealed a total regression of the infiltrations on PA chest X-ray (Figure 2).

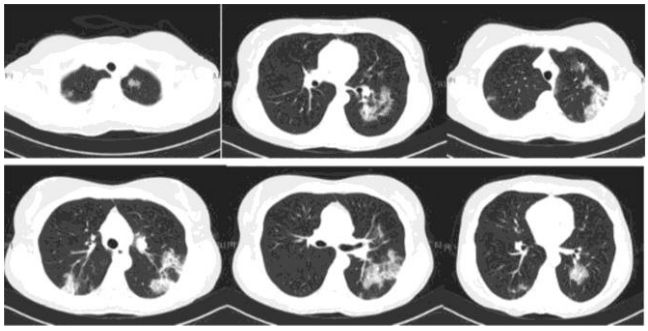

Figure 1: Bilaterally-dispersed nodules with blurry glass densities identified from a pulmonary tomography taken before treatment

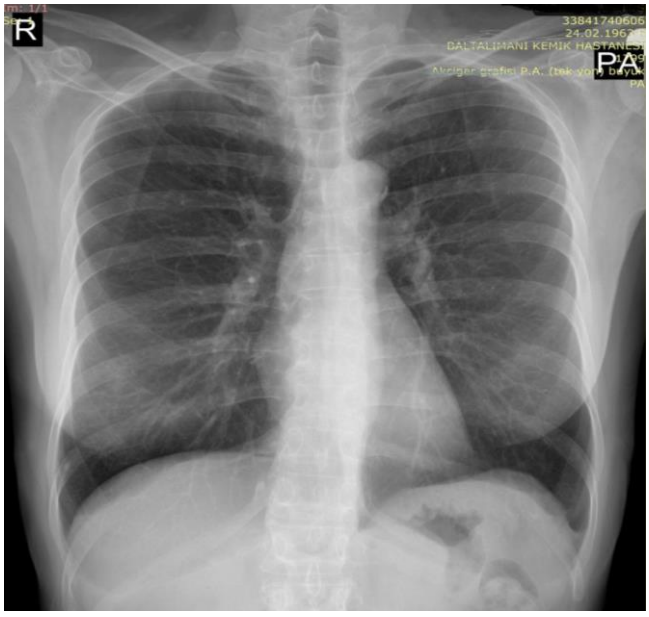

Figure 2: PA chest X-ray taken in the first month of treatment, in which the infiltrations can be seen to have totally disappeared

DISCUSSION

Eosinophilic pneumonia is an uncommon disease, but is more common in males than in females. It is mostly idiopathic but may also develop as a result of the inhalation of allergic antigens. In diagnosis, fever lasting fewer than 5 days, common infiltrations in posteroanterior chest X-ray, eosinophil rates greater than 25% in bronchoalveolar lavage fluid and dramatic response to steroids suggest acute eosinophilic pneumonia (6). Peripheral eosinophilia, which was detected at 24.4% in the blood count in the presented case, is a rare presentation in acute eosinophilic pneumonia. The presence of diffuse alveolar infiltrations on Thorax CT, the detection of 80% eosinophils in the bronchoalveolar lavage, and the lack of bacterial or fungal growth in the culture led us to the diagnosis of acute eosinophilic pneumonia. It is well known that corticosteroids respond well to treatment. In the presented case, a rapid regression of symptoms was noted after methylprednisolone treatment and the patient was discharged within two days. At the first month follow-up, almost full recovery was observed in the radiological findings.

There have been many studies and case series to date reporting a relationship between smoking and acute eosinophilic pneumonia. The mechanism of making AEP of cigarette is explained by its activating inflammation-stimulating mechanisms. Similarly, recent studies have shown that E-cigarettes cause cytokine stimulation like IL-6 and IL-8, and this condition shows that they can trigger acute eosinophilic pneumonia and other lung diseases, similar to smoking (7,8).

Respiratory failure often accompanies the clinical manifestation in acute eosinophilic pneumonia, and two other cases diagnosed with E-cigarette-related AEP have been reported in literature to date (4,5). In these two cases, the clinical manifestation was noisy, and one case was admitted to the Intensive Care Unit with respiratory failure after hospitalization. In our case, clinical improvement was achieved without respiratory failure as a result of our rapid diagnosis and treatment.

The radiological findings associated with EVALI (E-cigarette- or vaping-associated lung injury) most often include ground-glass opacities, while rarer findings include pleural effusions, pneumomediastinum and pneumothorax. EVALI may present with organizing pneumonia, lipoid pneumonia, diffuse alveolar damage, acute respiratory distress syndrome (ARDS), diffuse alveolar hemorrhage, hypersensitivity pneumonitis and giant-cell interstitial pneumonitis, aside from acute eosinophilic pneumonia (9).

In a 2019 EVALI case series reported by the CDC including 1,299 cases from 29 states, a total of 21 deaths associated with EVALI were reported. Of the 1,043 patients whose age and sex data were available, 70% were male and 80% were under the age of 35 years (10).

CONCLUSION

The use of E-cigarettes is increasing, much of which can be attributed to the industry's promotion of E-cigarettes as a means of "harm reduction" and a "method of quitting smoking". Studies into the use of E-cigarettes are increasing day by day, and as a result their effects on health are becoming better understood, the harm they can do to the lungs with increased use. In cases of sudden respiratory failure, the possibility of acute eosinophilic pneumonia should be considered in cases where the person was known to be healthy before using E-cigarettes.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - M.E.S., B.D., M.C., C.Ö., L.D.; Planning and Design - M.E.S., B.D., M.C., C.Ö., L.D.; Supervision - M.E.S., B.D., M.C., C.Ö., L.D. Funding -; Materials -; Data Collection and/or Processing -; Analysis and/or Interpretation - C.Ö.; Literature Review -; Writing - M.E.S.; Critical Review - L.D.

REFERENCES

1. McMillen RC, Gottlieb MA, Shaefer RM, Winickoff JP, Klein JD. Trends in electronic cigarette use among U.S. adults: use is increasing in both smokers and nonsmokers. Nicotine Tob Res 2015; 17:1195-202. [CrossRef]
2. Westenberger B. Evaluation of e-cigarettes. St. Louis, MO: Department of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research, Division of Pharmaceutical Analysis; May 4, 2009.
3. Henry TS, Kanne JP, Kligerman SJ. Imaging of Vaping-Associated Lung Disease. N Engl J Med 2019; 381:1486-7. [CrossRef]
4. Thota D, Latham E. Case report of electronic cigarettes possibly associated with eosinophilic pneumonitis in a previously healthy active-duty sailor. J Emerg Med 2014; 47:15-7. [CrossRef]
5. Arter ZL, Wiggins A, Hudspath C, Kisling A, Hostler DC, Hostler JM. Acute eosinophilic pneumonia following electronic cigarette use. Respir Med Case Rep 2019; 27:100825. [CrossRef]
6. Allen J, Davis W. Eosinophilic lung diseases. Am J Respir Crit Care Med 1994; 150:1423-38. [CrossRef]
7. Lerner CA, Sundar IK, Yao H, Gerloff J, Ossip DJ, McIntosh S, et al. Vapors produced by electronic cigarettes and e-juices with flavorings induce toxicity, oxidative

stress, and inflammatory response in lung epithelial cells and in mouse lung. PLoS One 2015; 10:e0116732. [CrossRef]

8. Wu Q, Jiang D, Minor M, Chu HW. Electronic cigarette liquid increases inflammation and virus infection in primary human airway epithelial cells. PLoS One 2014; 9:e108342. [CrossRef]

9. Layden JE, Ghinai I, Pray I, Kimball A, Layer M, Tenforde MW, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Final Report. N Engl J Med 2020; 382:903-916. [CrossRef]

10. Siegel DA, Jatlaoui TC, Koumans EH, Kiernan EA, Layer M, Cates JE, et.al. Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury - United States, October 2019. MMWR Morb Mortal Wkly Rep 2019; 68:919-27. [CrossRef]