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COVID-19 and EVALI: Considerations regarding two concurrent public health crises



Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has represented the primary public health concern in the United States (U.S.) since March 2020. However, e-cigarette or vaping product use-associated lung injury (EVALI), an acute lung injury most common in adolescents [1], remains a relevant public health crisis for emergency physicians. From 2017 to 2019, the number of 8th–12th graders who reported vaping doubled, and 12% of 12th graders reported vaping in 20 of the previous 30 days [2]. In the CDC's most recent report in February 2020, 2807 cumulative EVALI hospitalizations were identified [3], but in March 2020 public health focus shifted toward tracking and surveillance of COVID-19 [1]. Cases of EVALI from individual institutions suggest that cases may be continuing to rise [4], and the heightened awareness of COVID-19 in emergency settings may lead to delayed diagnosis in treatment of EVALI [5]. As vaccine hesitancy threatens long-term control over the pandemic [6], it is important to discuss the risk conferred from both COVID-19 and vaping, as well as strategies for clinicians to correctly differentiate between and effectively treat EVALI in the context of the COVID-19 pandemic.

The underlying pathogenesis of COVID-19 and EVALI are substantially different, as SARS-CoV-2 relies upon angiotensin-converting enzyme 2 (ACE2) expressed in the airway surface epithelium in order to mediate viral entry [7], while EVALI represents a general inflammatory and subsequent fibrotic response to chemical toxicants. However, COVID-19 infection has been found to be five times more likely in ever-users of e-cigarettes and seven times more likely in ever-dual-users of e-cigarettes and traditional tobacco cigarettes [8]. Autopsy findings suggest that lung damage in EVALI patients, including diffuse alveolar damage, organizing pneumonia, and chronic interstitial lung disease [9], may increase susceptibility to COVID-19 infection [1]. Another possibility is that vaping history predisposes the respiratory system to more dramatic symptoms in younger patients by decreasing the nasal mucosa IgA response [10], making patients more likely to seek medical care and subsequently receive a positive COVID-19 test.

The clinical overlap between presentations of COVID-19 and EVALI is well documented in the literature. In late 2019 (before the known start of the COVID-19 pandemic in the U.S.), a case series described 31 patients diagnosed with EVALI who were predominantly male (77%), young (median age 24), white (87%), and users of tetrahydrocannabinol-containing e-cigarettes (94%) [11]. The same institution published a follow-up case series in 2020 of 12 patients diagnosed with EVALI after the initial rise of COVID-19 in the U.S., in which patients presented similarly to those in the 2019 case series, but were now all considered with a differential diagnosis of COVID-19 [4]. Several case reports describe delayed EVALI diagnoses due to lack of thorough history taking early in admission [12] as well as the unnecessary use of COVID-19-specific medical

resources [13]. Actual concurrent diagnoses are rare, though at least one has been reported [14].

Several strategies have been discussed to differentiate between COVID-19 and EVALI in emergency settings. Bronchoscopic biopsy, though relatively invasive, has been suggested as useful in both differentiating EVALI from other infectious lung diseases [11] and excluding COVID-19 [15]. While both diagnoses tend to present with ground glass opacities on chest x-ray, EVALI is more commonly associated with subpleural sparing while COVID-19-positive patients more commonly display a peripheral infiltrate [12,16]. Moreover, COVID-19 is frequently associated with lymphocytopenia while EVALI has been associated with leukocytosis [12]. These clinical correlations may be useful tools to guide clinicians through the initial differential diagnosis upon admission.

A commonality seen across case reports is the emphasis on collecting a thorough clinical history as early as possible in the admission course [12,13]. Nearly all EVALI patients described in the literature have had a history of e-cigarette use, specifically using tetrahydrocannabinol-containing cartridges; this history was often not discovered until after initiation of treatment for COVID-19 due to suspicion of a false negative test result [13]. Emergency medicine physicians have only recently made the recommendation to ask patients about their history of e-cigarette use in the last 90 days when performing a workup for EVALI [17]. As EVALI remains a diagnosis of exclusion, it is essential that screening questions about e-cigarette use are asked upon admission, especially given the rise in less regulated brands of e-cigarette products [18] and increasingly potent active ingredients [19].

While U.S. public health efforts have remained focused on the COVID-19 epidemic, it is important to remain aware of the EVALI epidemic and the impact that e-cigarette use and vaping may have on the risk of contracting COVID-19. Furthermore, it is critical for emergency physicians to be aware of similar clinical presentations between COVID-19 and EVALI and to understand the importance of thorough history taking in determining disease etiology [20]. As vaccine hesitancy and the introduction of novel variants of SARS-CoV-2 (most recently the omicron variant [21]) continue to keep COVID-19 a public health threat, differentiating these diagnoses and developing targeted treatment options will become vital for emergency physicians and patients alike.

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