

# **E-CIGARETTES OR VAPING ASSOCIATED PULMONARY INJURY**

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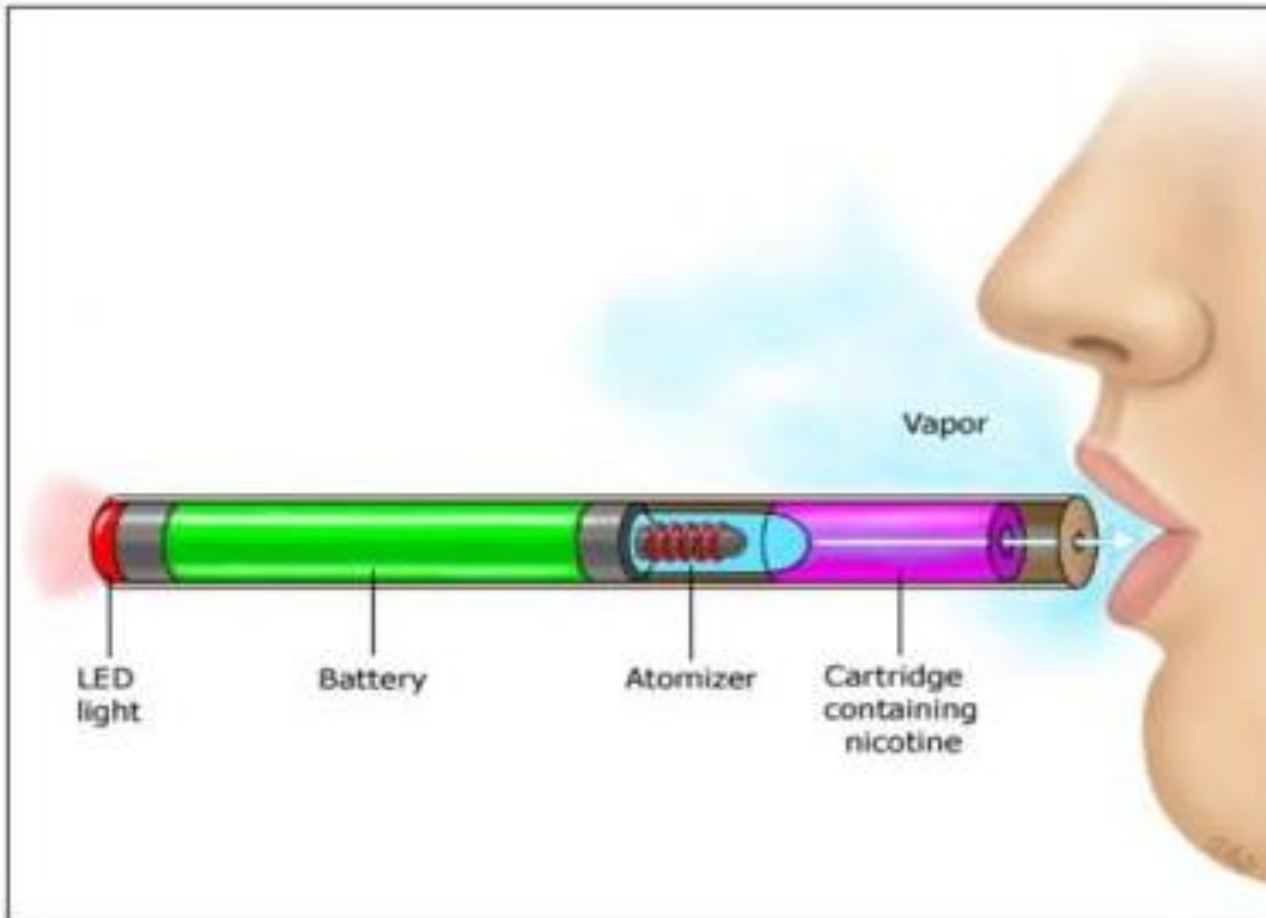
# What are e-cigarettes?

- E-cigarettes produce an aerosol by heating a liquid that usually contains nicotine , flavorings, and other chemicals.
- E-cigarettes come in many shapes and sizes. Most have a battery, a heating element, and a place to hold a liquid.
- E-cigarettes are known by many different names. They are sometimes called “e-cigs , “mods,” “vape pens,” “vapes,” and “electronic nicotine delivery systems (ENDS).”
- E –cigarettes entered the market in 2003 china , US & EU 2006.



# E-cigarette

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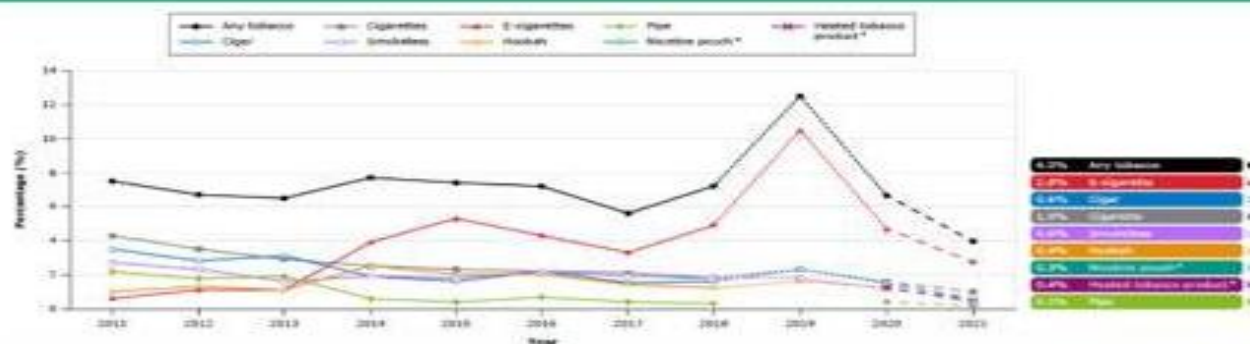
# Who is using e-cigarettes?

- In 2022, 2.55 million U.S. middle and high school students used e-cigarettes in the past 30 days ( 9.4 % )
- In 2020, 3.7% of U.S. adults currently used e-cigarettes.
- In 2019, among current adult e-cigarette users overall, 37 % also currently smoked cigarettes, 40 % formerly smoked cigarettes , and 23 % had never smoked cigarettes.
- Most adult current users of e –cig currently or previously used conventional cigarette ( dual user )



# Current tobacco product use among middle school students (NYTS, 2011-2021)

## Current tobacco product use among middle school students (NYTS, 2011-2021)



Dashed and dotted lines represent changes in survey methodology and may affect the comparability of results with prior years. In 2019, data collection included a new electronic mode of survey administration as well as presentation of tobacco images; in 2020, data collection was terminated early due to the COVID-19 pandemic; and in 2021, many students participated in distance learning so survey questionnaires were administered both remotely and in school settings.

# What are the health effects of using e-cigarettes?

There is uncertainty about the long term health effects.

Most e-cigarettes contain nicotine, which has known health effects.

- Nicotine is highly addictive.
- Nicotine can harm adolescent and young adult brain development
- Nicotine is a health danger for pregnant adults and their developing babies.
- Cardiovascular & pulmonary complications .



# What is in e-cigarette aerosol?

The e-cigarette aerosol that users breathe from the device and exhale can contain harmful and potentially harmful substances, including:

- Nicotine
- oil compounds ( glycerin )
- Flavoring such as diacetyl, a chemical linked to a serious lung disease
- Volatile organic compounds
- Cancer-causing chemicals
- THC ( Tetrahydrocannabinol )
- metals such as nickel, tin, and lead





# Can e-cigarettes help adults quit smoking cigarettes ?

- E-cigarettes are not currently approved by the FDA as a quit smoking aid
- However, e-cigarettes may help non-pregnant adults who smoke if used as a complete substitute for smoking.
- Many adult e-cigarette users do not stop smoking cigarettes and are instead continuing to use both products (known as “dual use”).



# Are e-cigarettes less harmful than regular cigarettes?

- Experts do not yet know a lot about the long term health effects of vaping.
- E-cigarette aerosol generally contains fewer toxic chemicals & nicotine than the regular cigarettes .
- However, e-cigarette aerosol is not harmless. It can contain harmful substances, including nicotine, heavy metals like lead, volatile organic compounds, and carcinogens.



# WHAT PROBLEMS CAN VAPING CAUSE

- Nicotine dependence
- Respiratory related symptoms ( obstructive )
- Lung damage (Paranchymal )
- Cardiovascular diseases



# E-CIGARETTES ASSOCIATED LUNG INJURY (EVALI)

- Initially diagnosed in 2019 ( outbreak ), an acute or subacute respiratory illness that can be severe & life-threatening .
- Most cases involved use of both nicotine and cannabinoid products & most patients report last vaping in the week before symptom onset.
- More than 2800 hospitalization cases were reported by CDC & 68 death. 66% male , 80% < 35 y .



# PATHOGENESIS & RISK FACTORS

- It is a form of acute lung injury ( ALI ).
- THC (Tetrahydrocannabinol) : 80% patients with EVALI use of products containing THC .94% cases THC was detected in BAL.
- Vit E : more than 90 % patients was detected in BAL .
- Others : nicotine > 60 % in BAL , Oils



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## Vitamin E Acetate in Bronchoalveolar-Lavage Fluid Associated with EVALI

B.C. Blount, M.P. Karwowski, P.G. Shields, M. Morel-Espinosa, L. Valentin-Blasini, M. Gardner, M. Braselton, C.R. Brosius, K.T. Caron, D. Chambers, J. Corstvet, E. Cowan, V.R. De Jesús, P. Espinosa, C. Fernandez, C. Holder, Z. Kuklenyik, J.D. Kusovschi, C. Newman, G.B. Reis, J. Rees, C. Reese, L. Silva, T. Seyler, M.-A. Song, C. Sosnoff, C.R. Spitzer, D. Tevis, L. Wang, C. Watson, M.D. Wewers, B. Xia, D.T. Heitkemper, I. Ghinai, J. Layden, P. Briss, B.A. King, L.J. Delaney, C.M. Jones, G.T. Baldwin, A. Patel, D. Meaney-Delman, D. Rose, V. Krishnasamy, J.R. Barr, J. Thomas, and J.L. Pirkle, for the Lung Injury Response Laboratory Working Group\*



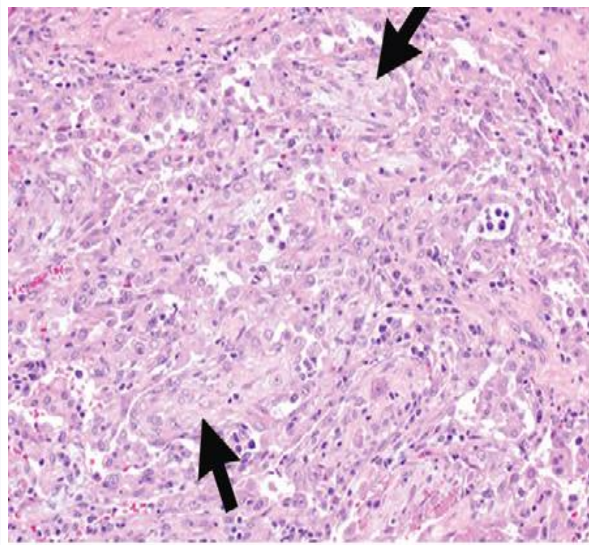
# PATHOLOGY

Several pathologic patterns of lung injury have been reported in the setting of vaping :

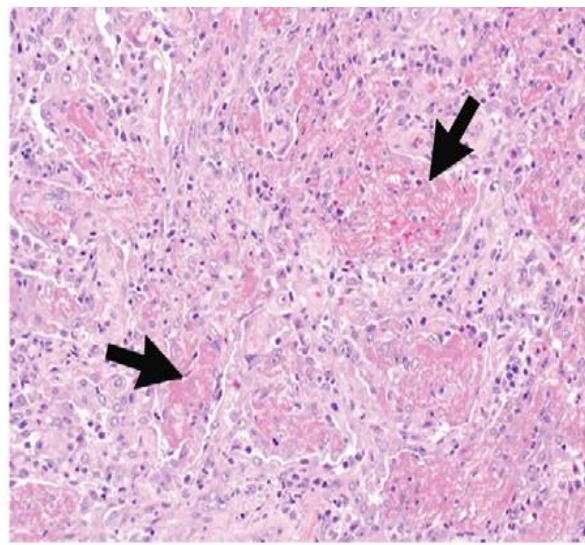
- Lipoid pneumonia (exogenous)
- Diffuse alveolar damage
- Acute eosinophilic pneumonia
- Organizing pneumonia
- Diffuse alveolar hemorrhage
- Respiratory bronchiolitis
- Hypersensitivity pneumonitis



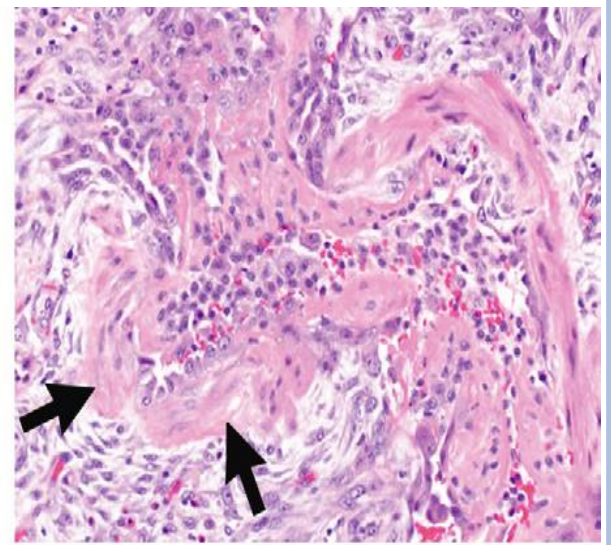




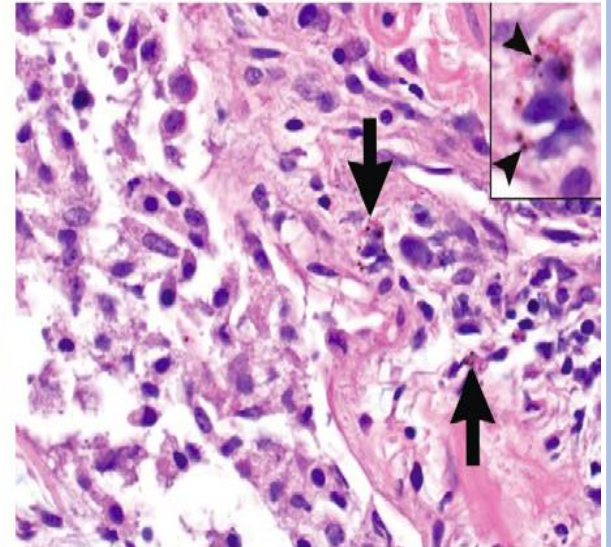
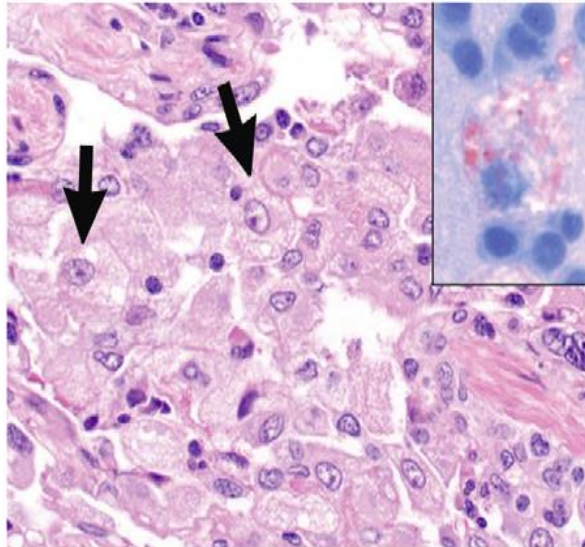
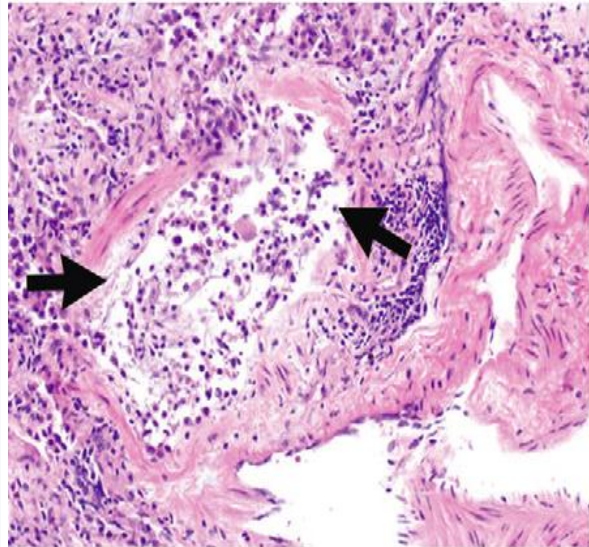
a.



b.



c.



Images show histopathologic findings of vaping-associated lung injury. Representative photomicrographs of lung biopsies from patients with electronic cigarette or vaping product use-associated lung injury show variety of acute injury patterns including (a) organizing pneumonia (arrows), (b) acute fibrinous pneumonitis with balls of intra-alveolar fibrin (arrows), and (c) diffuse alveolar damage with hyaline membranes (arrows). Other common findings include (d) bronchiolitis with bronchiolar mucosal ulceration (arrows) and (e) accumulation of foamy lipid-laden macrophages in alveolar spaces



# CLINICAL FEATURES

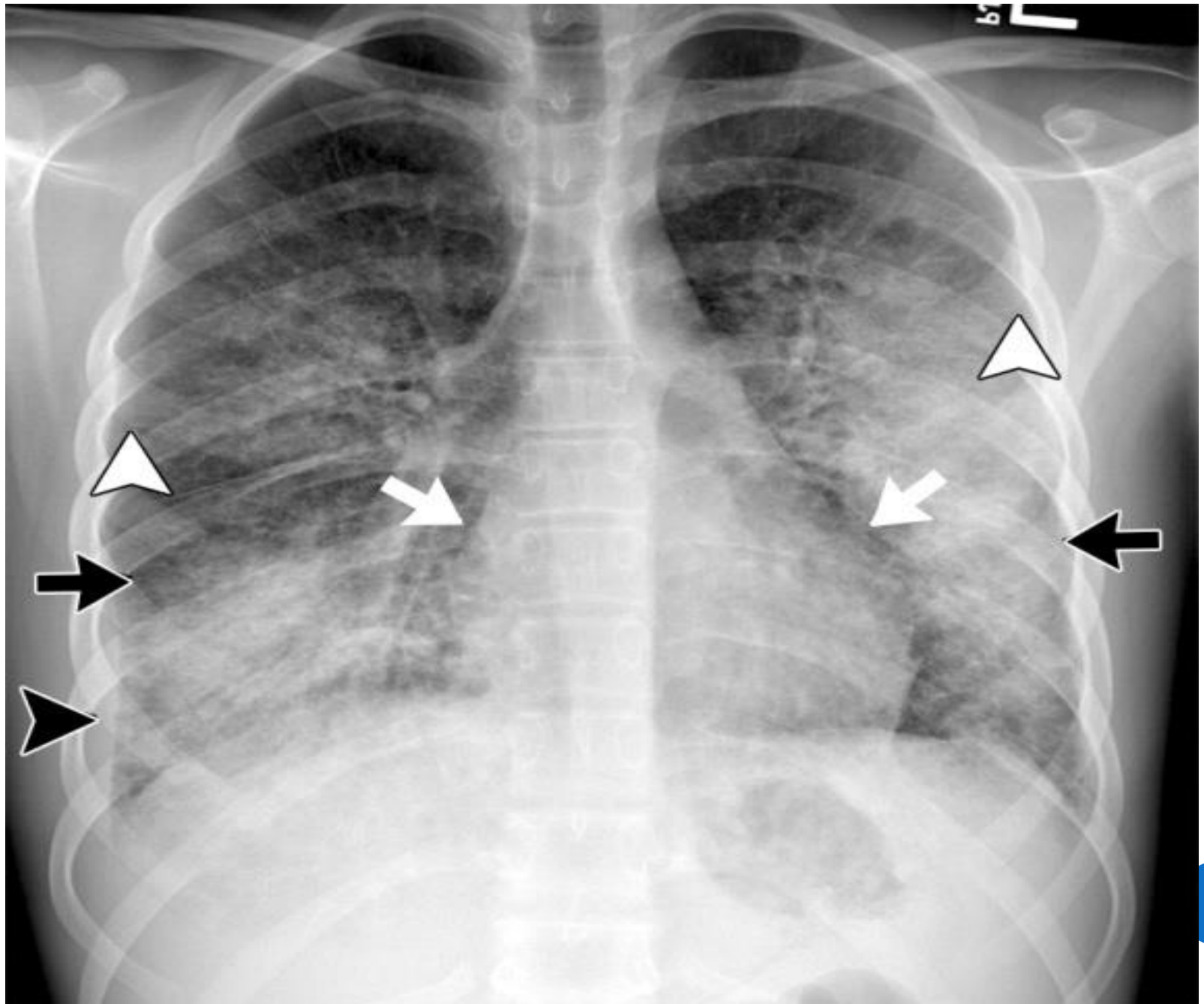
- Median age 21 y , Male 80% ,
- SOB , Cough , chest pain , hemoptysis , fever , GI symptoms
- In PE fever , tachypnea , tachycardia , hypoxemia & RF .
- Lab : lab evaluation is designed for exclude of other DD ( pneumonia , covid . DAH , AEP ,...)



# IMAGING

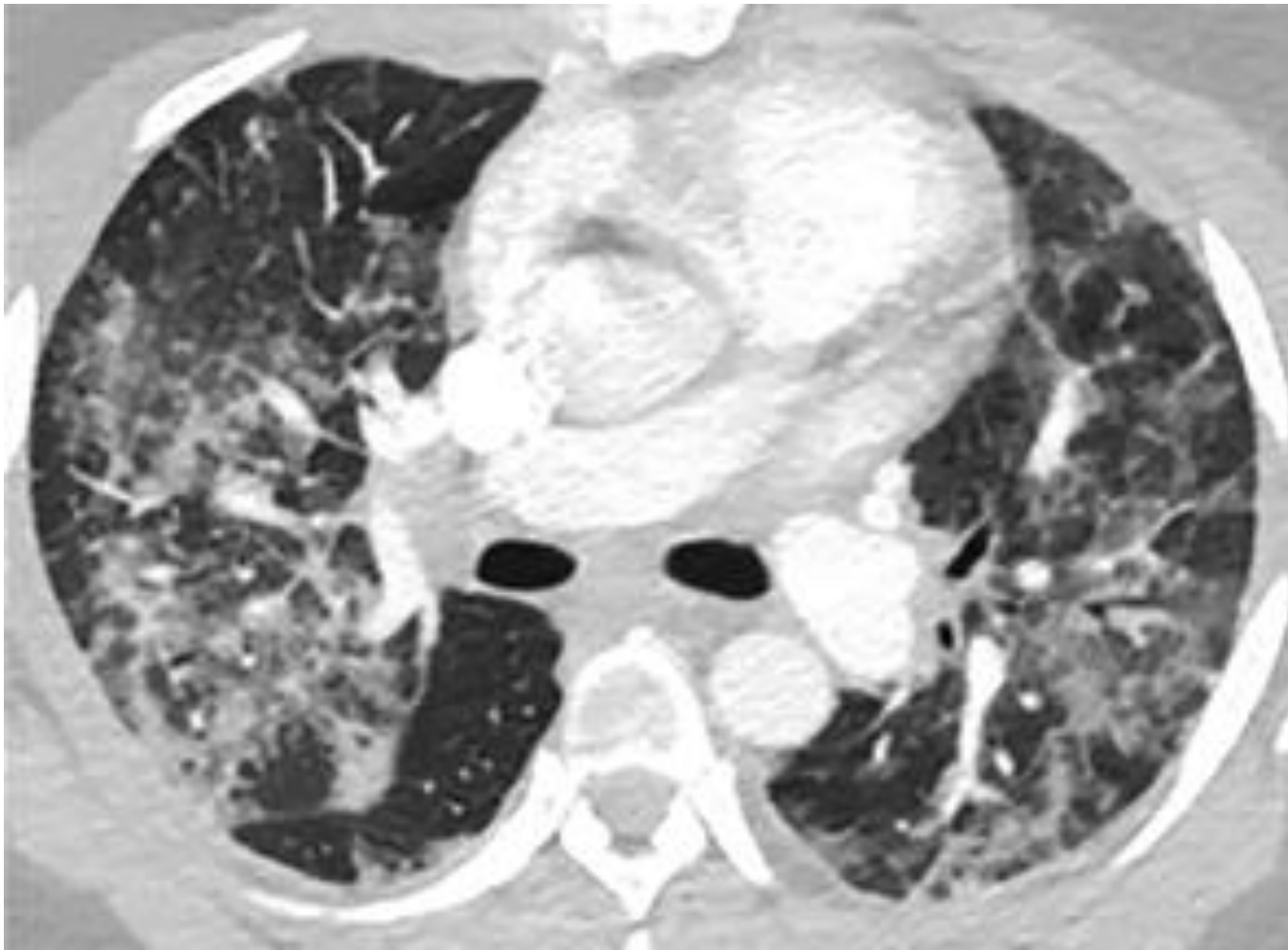
- Diffuse bilateral opacities(GG or conolidation )
- Nearly in 100 % cases
- Pleural effusion , Pneumothorax & pneumomediastinum are rare .









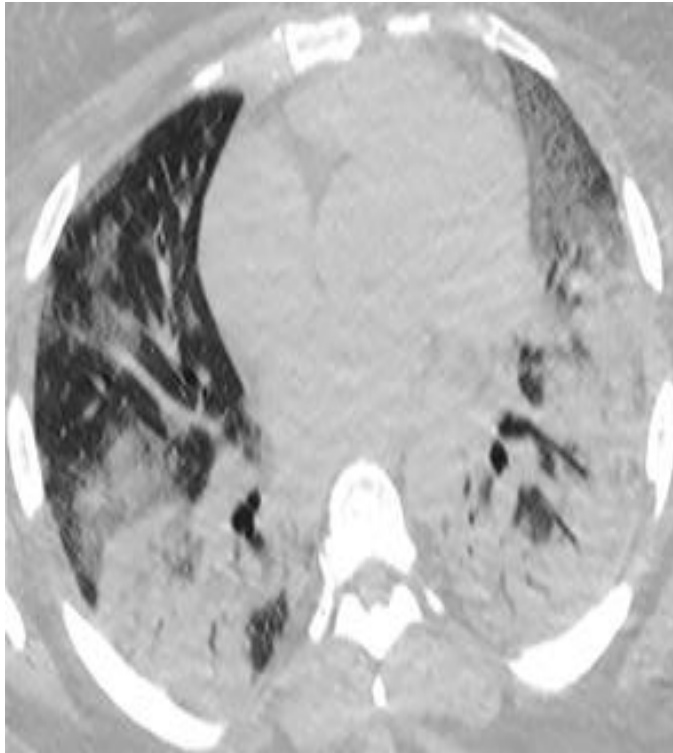


A 36-year-old woman with e-cigarette or vaping product use—associated lung injury with CT images showing pattern of acute lung injury (ALI).

CT images of mid and lower lungs show GGOs consistent with ALI.







A 34-year-old woman with e-cigarette or vaping product use—associated lung injury with CT images showing pattern of chronic eosinophilic pneumonia (CEP) or organizing pneumonia (OP). subpleural ground-glass opacities (GGOs) and consolidation suggesting CEP or OP pattern.

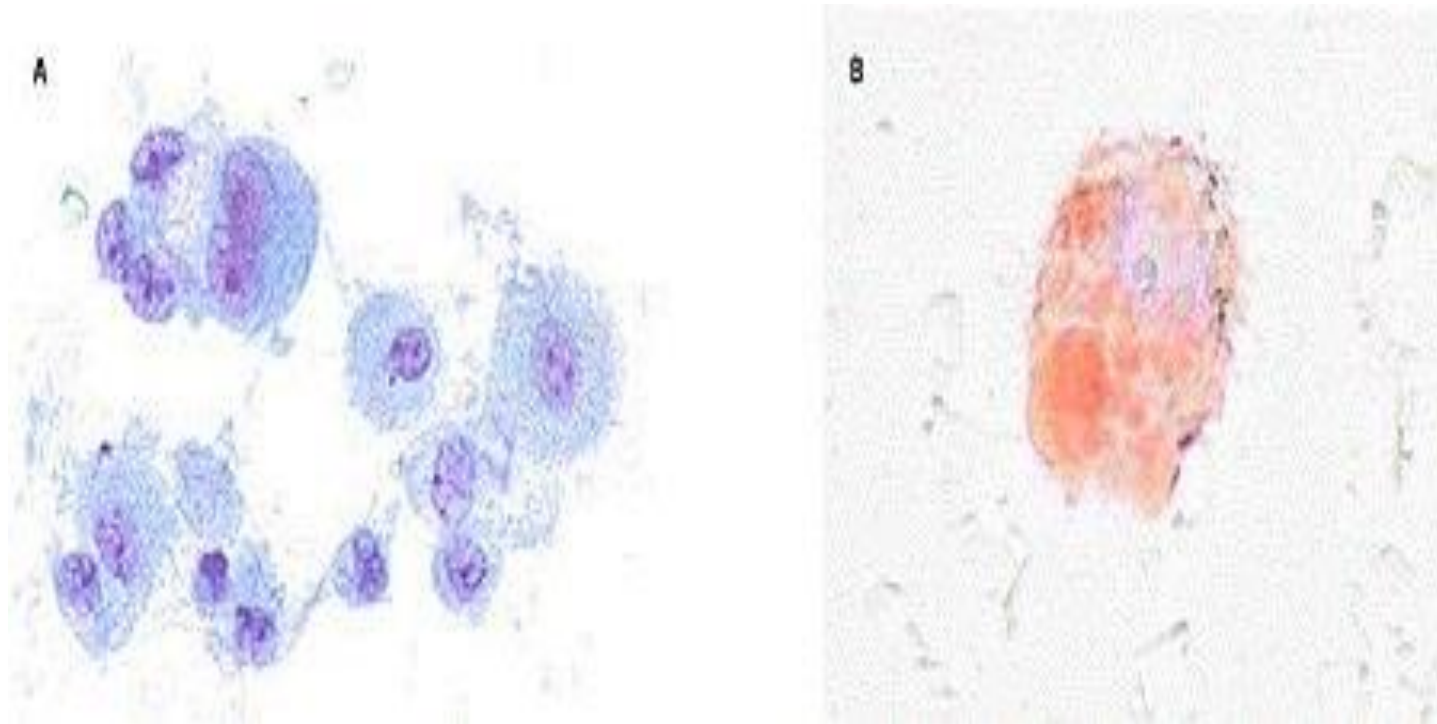


# FIBEROPTIC BRONCHOSCOPY

- FOB is non diagnostic for EVALI
- Can be helpful for excluding other DD , infection , DAH ,.....
- BAL : show increase PMN , Eos cells , lipid laden macrophage.
- TBLB ( lung tissue sampling )







Bronchoalveolar lavage sample from a patient with acute lung injury associated with vaping, showing alveolar macrophages laden with vacuoles (A) and extensive lipid deposits



## Proposed criteria for EVALI

Confirmed case
<ul style="list-style-type: none"><li>■ Use of an e-cigarette ("vaping") or "dabbing" in the previous 90 days*</li></ul>
<ul style="list-style-type: none"><li>■ Lung opacities on chest radiograph or computed tomography</li></ul>
<ul style="list-style-type: none"><li>■ Exclusion of lung infection based on:<ul style="list-style-type: none"><li>● Negative influenza PCR or rapid test (unless out of season)</li><li>● Negative respiratory viral panel</li><li>● Negative testing for clinically-indicated respiratory infections (eg, urine antigen test for <i>Legionella</i> and <i>Streptococcus pneumoniae</i>, blood cultures, sputum cultures if producing sputum, and bronchoalveolar lavage if performed)</li><li>● Negative testing for HIV-related opportunistic respiratory infections (if appropriate)</li></ul></li></ul>
<ul style="list-style-type: none"><li>■ Absence of a plausible alternative diagnosis (eg, cardiac, neoplastic, rheumatologic)</li></ul>



# TREATMENT

- Definite treatment is not known.
- Admission ,supportive care , O2 therapy , HFNo ,NIV , MV
- Most important step is to ensure the CAP & viral infection is not overlooked.
- Empiric AB .
- Systemic steroid is indicated in progressive symptoms & hypoxemia. Methylprednisolone 0.5 -1 mg/kg for 5-10 days.



# Conclusion

- Electronic cigarettes, often used as a safer alternative to traditional cigarettes, have proven to have unexpected deleterious health consequences.
- Electronic cigarette or vaping product use—associated lung injury (EVALI), characterized primarily by acute lung injury, has emerged as a serious and sometimes fatal complication of vaping.
- THC, Vit E acetate & other compounds have been implicated in pathogenesis of EVALI.

