

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The effect of opioids on the lung

دکتر سپیده صفانوايي

Opioids can cause toxicities in many different organ systems, including central nervous system (CNS), cardiovascular, and pulmonary

Their effects on the pulmonary system can be direct, such as causing granulomatous change, or indirectly.

opioids cause respiratory depression by decreasing sensitivity of peripheral chemoreceptors to carbon dioxide and decreasing activity in the central respiratory centers. Opioids have also been reported to affect the immune system, and place users at increased risk for many different infectious complications. Patients can have a wide array of signs and symptoms, sometimes making it difficult to recognize opioids as a cause for a patient's clinical picture. Due to the sedative effects of opioids, patients are also often not able to provide a reliable history. Knowledge of the possible toxicities of opioids can help prepare a physician to recognize the many complications associated with opioid use

Airway Complications

1_Pneumothorax

“pocket shot”

secondary to infectious

Barotrauma leading to

pneumothorax or pneumomediastinum

2_Nasal Perforation

insufflating opioid medications intended for oral use has led to necrosis

3_Vocal Cord Paralysis

complication of the pocket shot injection

Indirect Effects on the Lung

- Respiratory Depression
- Truncal Rigidity

Direct Effects on the Lung

- ❖ Bullae
- ❖ Pulmonary Edema
- ❖ Pulmonary Hemorrhage
- ❖ Granulomatous Change
- ❖ Lung Cancer

Indirect Effects on the Lung

Respiratory Depression

Opioid action at both mu and delta receptors has been linked to respiratory depression decreased sensitivity of chemoreceptors and decreased activity in the central respiratory centers

Opioids produce this effect through two different mechanisms; decreased sensitivity of chemoreceptors and decreased activity in the central respiratory centers. Peripheral chemoreceptors are found in the carotid and aortic bodies, as well as within the lungs. They respond to decreased partial pressure of oxygen (pO_2) or increased partial pressure of carbon dioxide (pCO_2) by increasing signal transduction.

Peripheral chemoreceptors are found in the carotid and aortic bodies, as well as within the lungs. They respond to decreased partial pressure of oxygen (pO_2) or increased partial pressure of carbon dioxide (pCO_2) by increasing signal transduction. Central receptors respond only to increased pCO_2 and are located in the medulla but are separate from the main respiratory center. Morphine has been shown to decrease the sensitivity of these chemoreceptors to pCO_2 .

Central respiratory centers within the medulla contain both mu and delta opioid receptors. Opioid action within the respiratory center results in decreased respiratory rate, as well as decreased tidal volumes, both of which can result in decreased minute ventilation. These effects also appear to be dose-dependent, with low doses of opiates decreasing tidal volume, while high doses decrease both tidal volume and respiratory rate. Opioid medications increased the number of apneic sleep episodes. There was no change in obstructive sleep apnea signs; however, there was a mean increase of 3.2 central apneic events per hour.

Truncal Rigidity

Muscle rigidity has been a reported adverse effect of opioid administration. This rigidity can involve any muscle or muscle group. Most is truncal rigidity with involvement of the respiratory muscles, laryngeal structures, or the chest wall, a life-threatening complication

Direct Effects on the Lung

Bullae

Both IV and inhalational heroin use may also lead to bullous pulmonary changes. Intravenous illicit drug users have a different pattern of lung disease than non-IV drug users. The bullae in drug users are more likely to be larger, bilateral, and in the upper lobes. In non-users often vary in size and are more diffuse. A case series of opium smokers in Singapore showed 24 % prevalence of bullae



Pulmonary edema(NCPE) drugs, including heroin, methadone, morphine, and propoxyphene

The incidence of NCPE in patients hospitalized for heroin overdose is 3 % increased risk of NCPE include male sex, short duration of heroin use (mean, 2.9 years), GCS < 8 requiring naloxone

Up to 50 % co-intoxication with ethanol or cocaine

Pathogenesis→unknown. suggest naloxone plays a role,

Possible mechanisms include hypoxia, direct effects of heroin, neurogenic effect, hypersensitivity reaction, increased capillary permeability

The negative pressure created is thought to draw fluid into the alveoli, leading to pulmonary edema.

mechanism for naloxone increase in catecholamine Epinephrine
concentration increased 30-fold in naloxone administration

increases in heart rate, stroke volume, and systolic arterial pressure,
with a decrease in systemic vascular resistance.

Treatment

supportive,

oxygen

mechanical ventilation (40/)

Usually present within 4 h of overdose,

symptoms resolve within 24–48 h

Pulmonary Hemorrhag

reported from severe opioid intoxication.

Mechanism combination of hypoxic alveolar damage and negative-pressure barotrauma.

is rare, and this was the only case reported in the literature.

Granulomatous Change

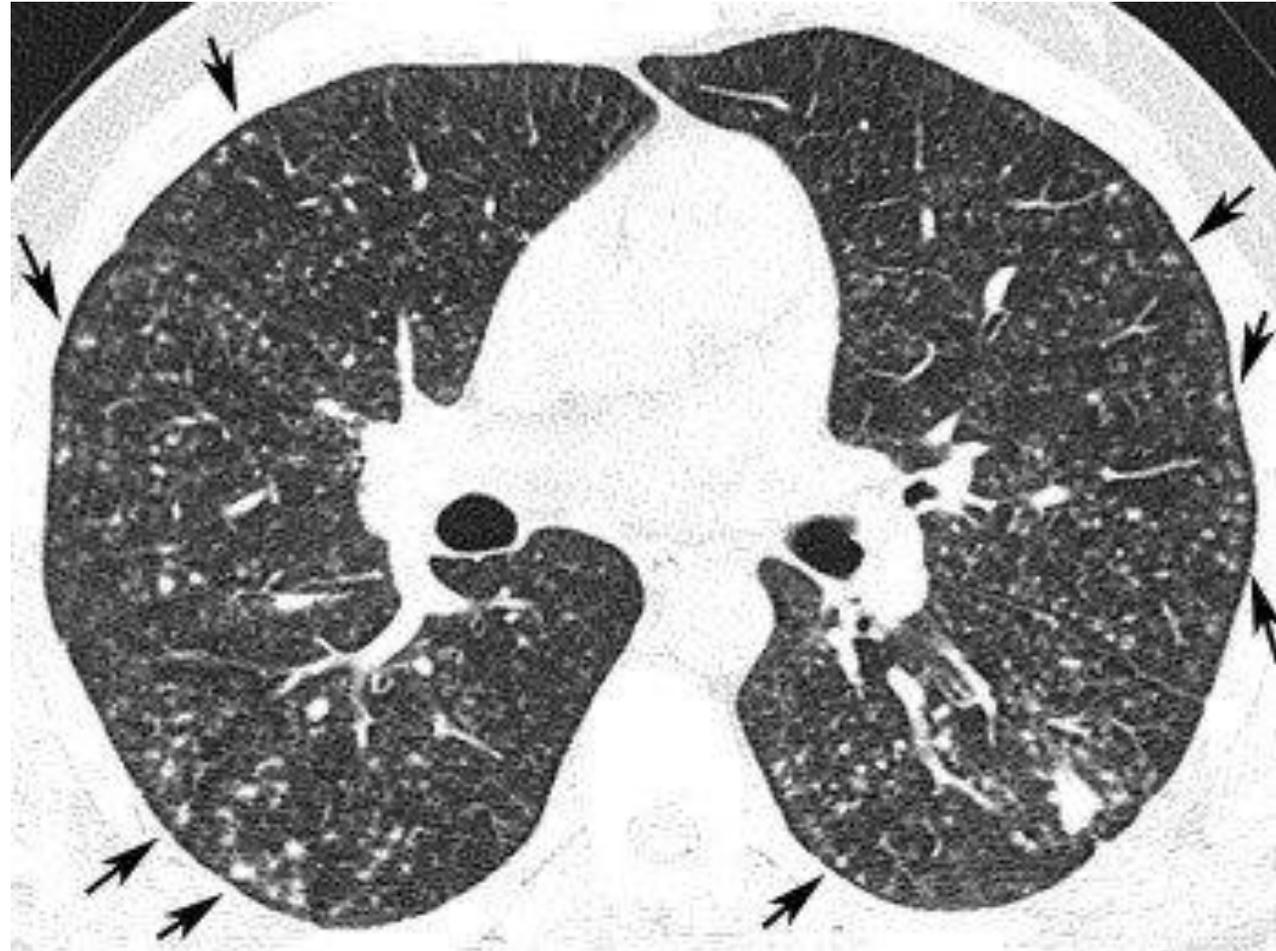
multiple filler materials in the lungs, including talc, starch, cellulose, magnesium stearate, and siliciumoxid. While these different fillers were all identified in the lungs, talc was found in other organs as well, including the spleen, liver, lymph nodes, and bone marrow. Of these materials, talc was the only filler associated with granulomatous reactions

Histologic findings of pulmonary talcosis ; perivascular talc that resulted in macrophage and giant cell accumulation in the perivascular space. Increased fibrosis contribute to the development of pulmonary hypertension

Clinical manifestation: asymptomatic to severe dyspnea.

Late findings include chronic respiratory failure, pulmonary hypertension, and cor pulmonale. Symptoms may also manifest years after discontinuation of IV drug abuse.

Computed tomography findings of talc granulomatosis include centrilobular nodules with heterogeneous conglomerate masses, with or without emphysema



Lung Cancer

mortality rates from lung and cancers may be increased in opioid-dependent persons, but decreased mortality from breast cancer. Some studies have shown that opioids induce tumor growth and inhibit apoptosis, promoting angiogenesis and migration of tumors cells.

Other studies shown that morphine inhibits angiogenesis and promotes apoptosis of tumor cells

One study showed an increase in cell death in response to opioids, but the amount of cells that died was only 1–2 % of the total cell population

Immunogenic Complications

Bronchospasm with both inhalational and intravenous use of heroin. occurred in patients with asthma as well as those without mechanism is histamine release. from mast cells This increase in histamine results in bronchoconstriction and reversible airway obstruction.

This effect has been reported with medicinal opioids, but the bronchospasm may also be related to contaminants or fillers within the heroin

Eosinophilic Pneumonia

recovered quickly after cessation of heroin inhalation and with corticosteroid therapy

Infectious Complications

significant risk factor for infectious complications. Users are more susceptible to pulmonary infections, as well as endovascular, skin, soft tissue, bone, joint, and sexually transmitted infections because unsterile injection practices, contaminated products, increased exposure to pathogens, as well as changes to the host immunity

Pneumonia

elderly patients, opioid use increased the risk of pneumonia

highest with recent initiation of opioid use (within the last 14 days) and with long-acting opioids secondary to the immuno-modulatory effects of opioids

Tuberculosis

The prevalence of mycobacterium tuberculosis (TB) is much higher in injection drug users than it is in the general public. The prevalence in North America is estimated to be 12–39 %, depending on local epidemiolog

Risks, including homelessness, poverty, overcrowding and imprisonment
Patients with HIV infection are at an increased risk for TB, and as discussed earlier, IV drug users are at higher risk for HIV

Endocarditis

The tricuspid valve is the most commonly involved valve in infectious endocarditis from IV drug abuse. Intravenous heroin users are more likely to develop right-sided infectious endocarditis compared with IV cocaine and/or methamphetamine users. The reason for this difference is unknown but is possibly related to fibrosis as a result of increased inflammation in response to opioids. Postmortem samples of myocardium from chronic drug users who died from opioid intoxication showed a fivefold increase in the number of inflammatory cells within the myocardium compared to controls.

Thanks for your attention