Respiratory system pathology

By

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case presentation-1
Diffintion of acute lung injury-2
Pathogensis-3
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RDS in new borne -6
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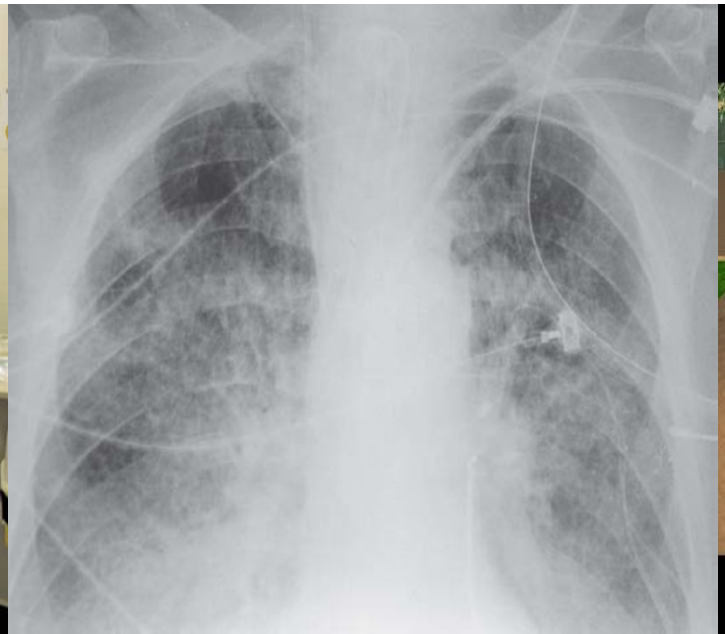
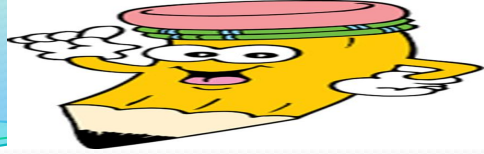
Case presentation

A 40-year-old woman is rushed to the emergency room following sever burn ,after that presents with sudden attack of sever dyspnea , Pink or blood tinged ,frothy sputum ,and appears to be in a state of profound shock .On CXR showing . diffuse bilateral infiltration

The characteristic microscopical picture of acute stage on ?lung biopsy



Review



.Inflammation is the response of vascularized living tissue to injury-

It may be evoked by microbial infections, physical agents,-
.chemicals, necrotic tissue, or immune reactions

Inflammation is intended to contain and isolate injury, to destroy -
invading microorganisms and inactivate toxins, and to prepare the tissue for healing and repair

Components of Acute Inflammation

Vascular changes .1

- There will be increase in blood flow
- Aims to bring cells and proteins to the site of injury

Cellular events .2

- Recruitment of leukocytes
- Aims to activate the leukocytes leading to the process of destruction of invaders

Acute Lung Injury(ALI)

ALI is lung inflammation(acute onset) that develops in response to a .variety of both pulmonary and generalized acute diseases

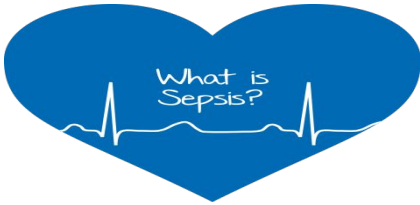
ALI is a spectrum of pulmonary lesions (endothelial and epithelial),- which can be initiated by variety of both pulmonary and generalized .acute diseases

The clinical features of acute lung injury vary from mild(self-limiting ▪ .dyspnea) to rapidly progressive and fatal respiratory failure

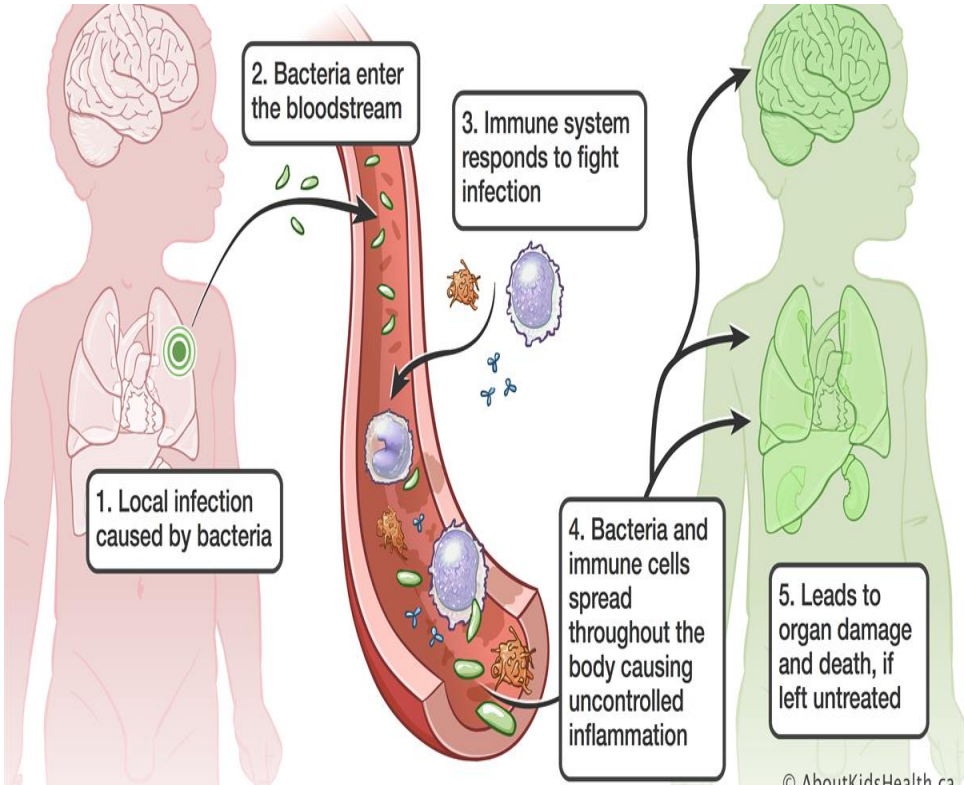
- **inflammation of lung (ALI) will lead to pulmonary edema in absent of HF and called non cardiogenic pulmonary edema and without evidence of hydrostatic pulmonary edema) .**

-It characterized by significant hypoxemia and bilateral pulmonary infiltration.

, The lung injury may be direct ,as occurs in Pneumonia-Aspiration of gastric contents and toxic inhalation or indirect as occur . in sepsis



Sepsis:- presence of pathogenic organisms or their toxins in blood and tissues causing injury to its own tissues and organs and it is a life-threatening condition



Acute Respiratory Distress Syndrome (ARDS) or called (Diffuse Alveolar Damage)

- **It is a manifestation of severe form of the ALI spectrum**

- **ARDS is a clinical syndrome caused by diffuse alveolar and capillary damage**

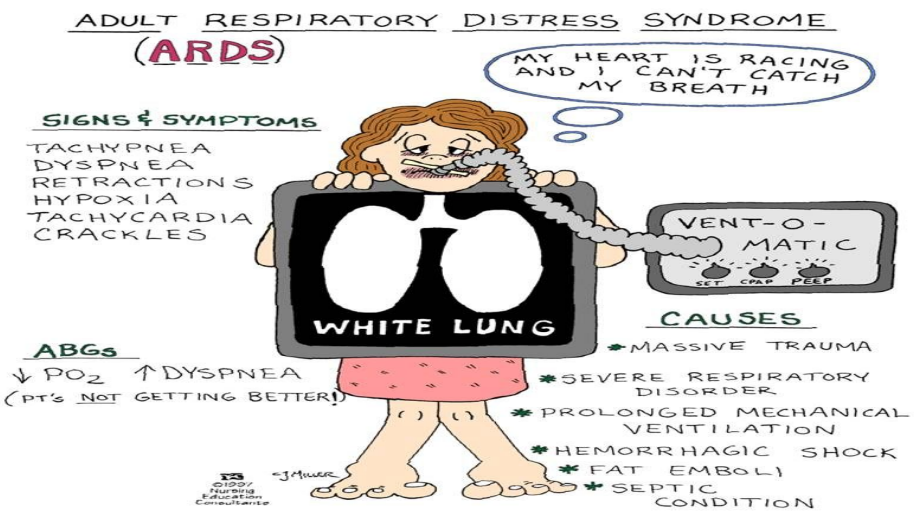
- **ARDS is a syndrome in which there is pulmonary edema without increment in the pulmonary capillary venous pressure or non cardiac pulmonary edema**

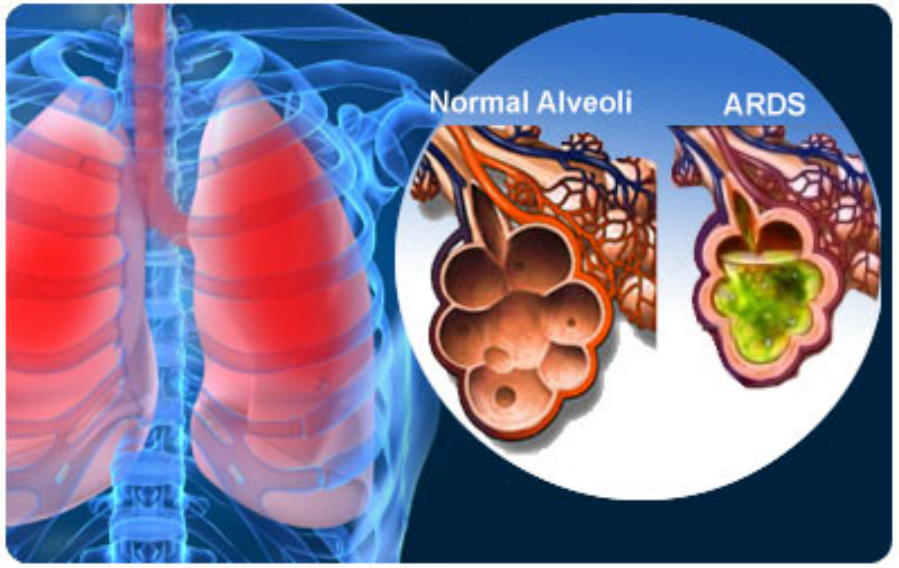
- **ARDS is a clinical syndrome of sever dyspnea of rapid onset, hypoxemia and diffuse pulmonary infiltration leading to respiratory failure .**

Causes of ALI and ARDS

The lung injury may be direct ,as occurs in toxic inhalation sever pulmonary infection, oxygen therapy ,trauma to lung

or indirect as occur in sepsis ,trauma, sever type of burn, sever type of pancreatitis , uremia(very high blood urea) , immune reactions , if prolong surgery cause ARDS ,and all shock states can cause ARDS ,that is why ARDS is called shock lung





Pathogenesis of ALI and ARDS.

1- Endothelial activation is an important early event.

2-Neutrophils play a key role in the pathogensis of ARDS . Neutrophils migrate into the interstitium and the alveoli, where they degranulate and release inflammatory mediators, including proteases, reactive oxygen species, and cytokines.

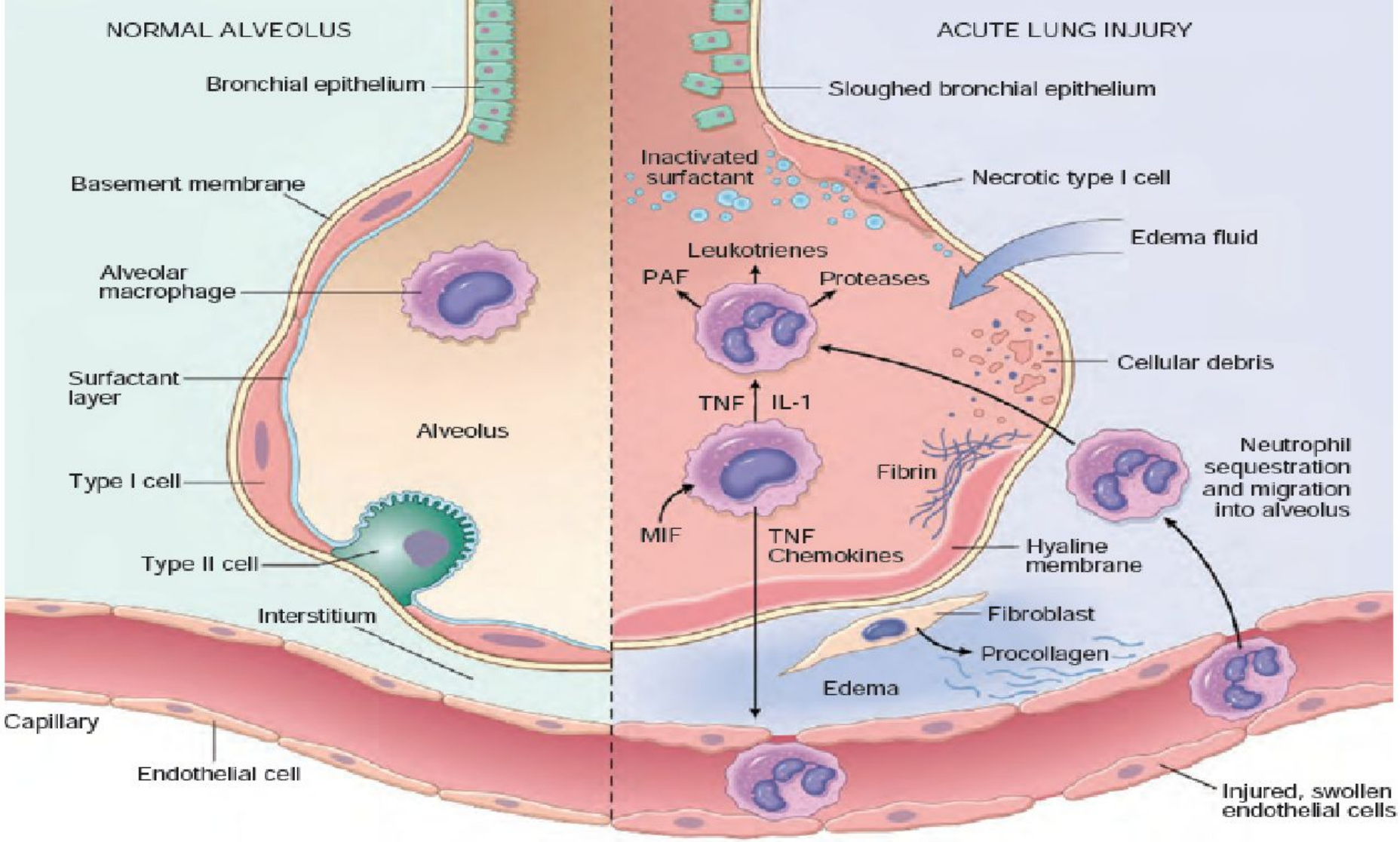
3-Macrophages which helps to sustain the ongoing pro-inflammatory response.

The result is increased recruitment and adhesion of leukocytes, causing more endothelial injury.

4- Accumulation of intra alveolar and interstitial fluid and formation of pulmonary edema .

5-Damage and necrosis of type II alveolar pneumocytes leads to surfactant abnormalities, further compromising alveolar gas exchange.

Any cause lead to effect on the integrity of the alveolar wall vascular/air interface by damage to capillary endothelium and/or alveolar epithelium lead to pulmonary edema .



The normal alveolus (left side) compared with the injured alveolus in the early phase of acute lung injury and acute respiratory distress syndrome.

The fate of ALI and ARDS either:-

1-Resolution of injury is impeded in ALI/ARDS due to epithelial necrosis and inflammatory damage thus , macrophages remove intra alveolar debris .
2-Bronchiolar stem cells proliferate to replace pneumocytes .

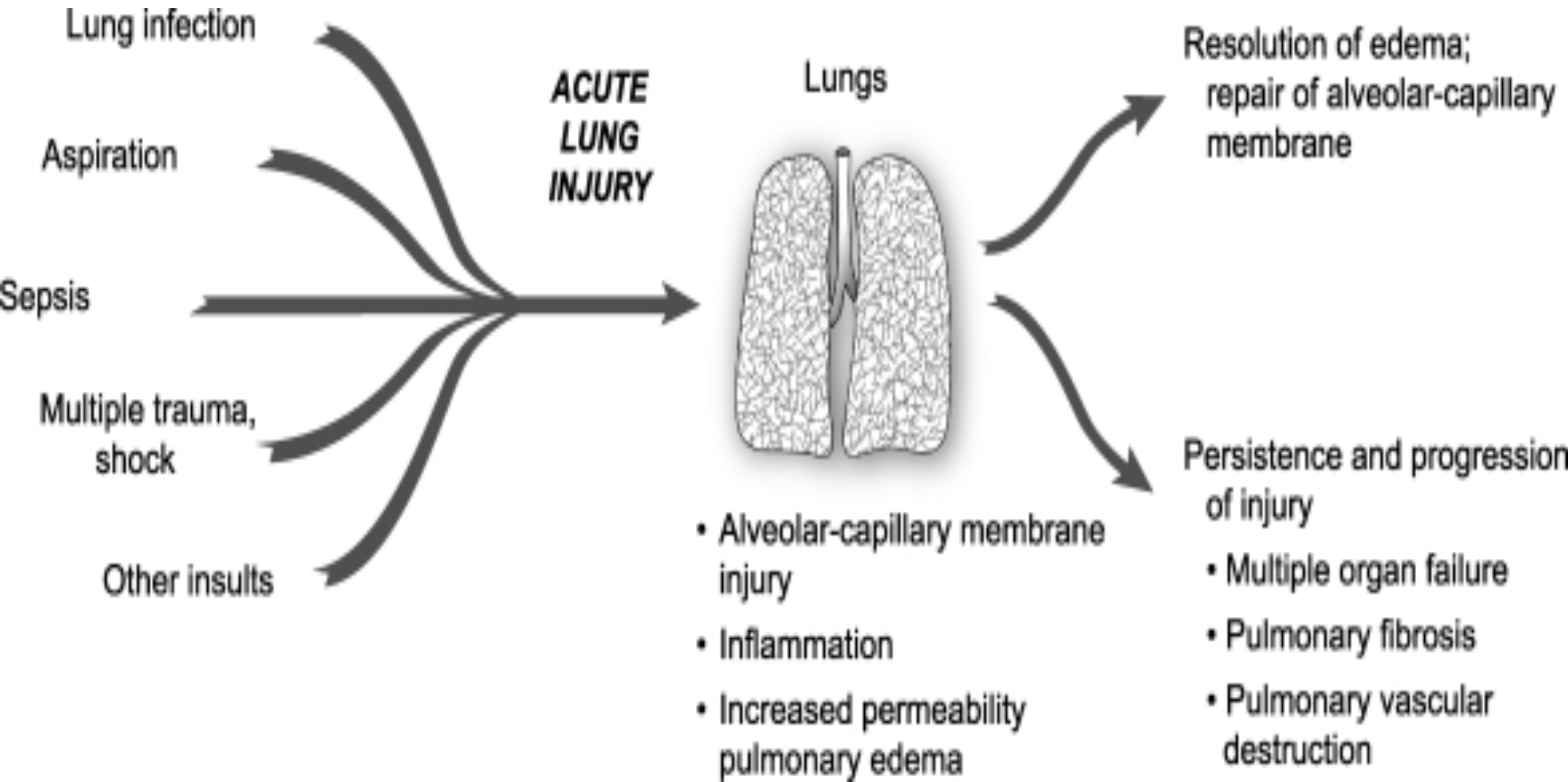
3- Endothelial restoration occurs through proliferation of uninjured capillary endothelium.

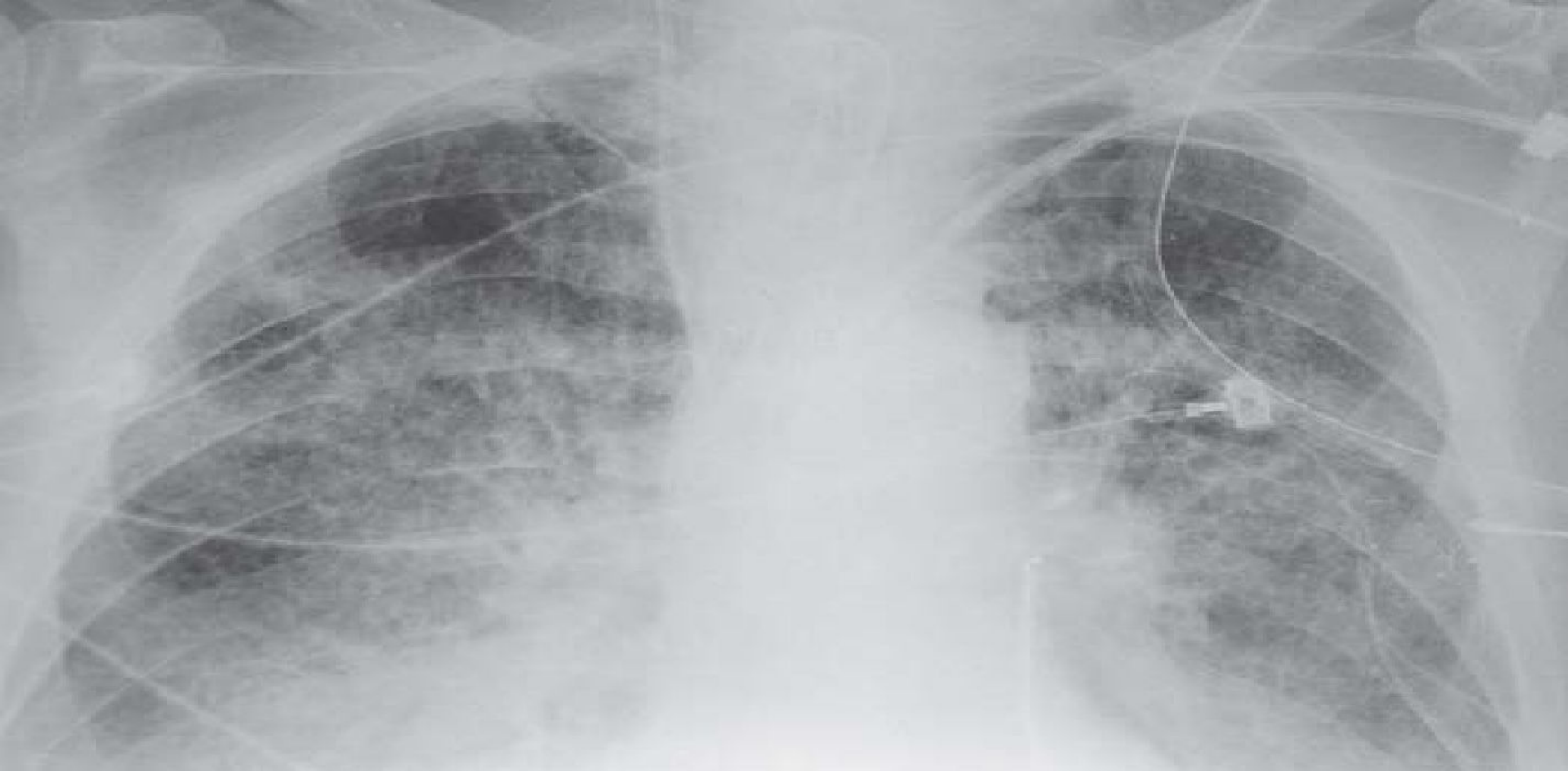
4-Ultimately, the inspissated protein-rich edema fluid and debris from dead alveolar epithelial cells organize into hyaline membranes, a characteristic feature of ALI/ARDS.

Or , the fate of ALI and ARDS

5-If the damage is persist and progress this lead fibrosing alveolitis and interstitial fibrosis .

Thus , ALI/ARDS includes resolution and repair versus persistence and progression.



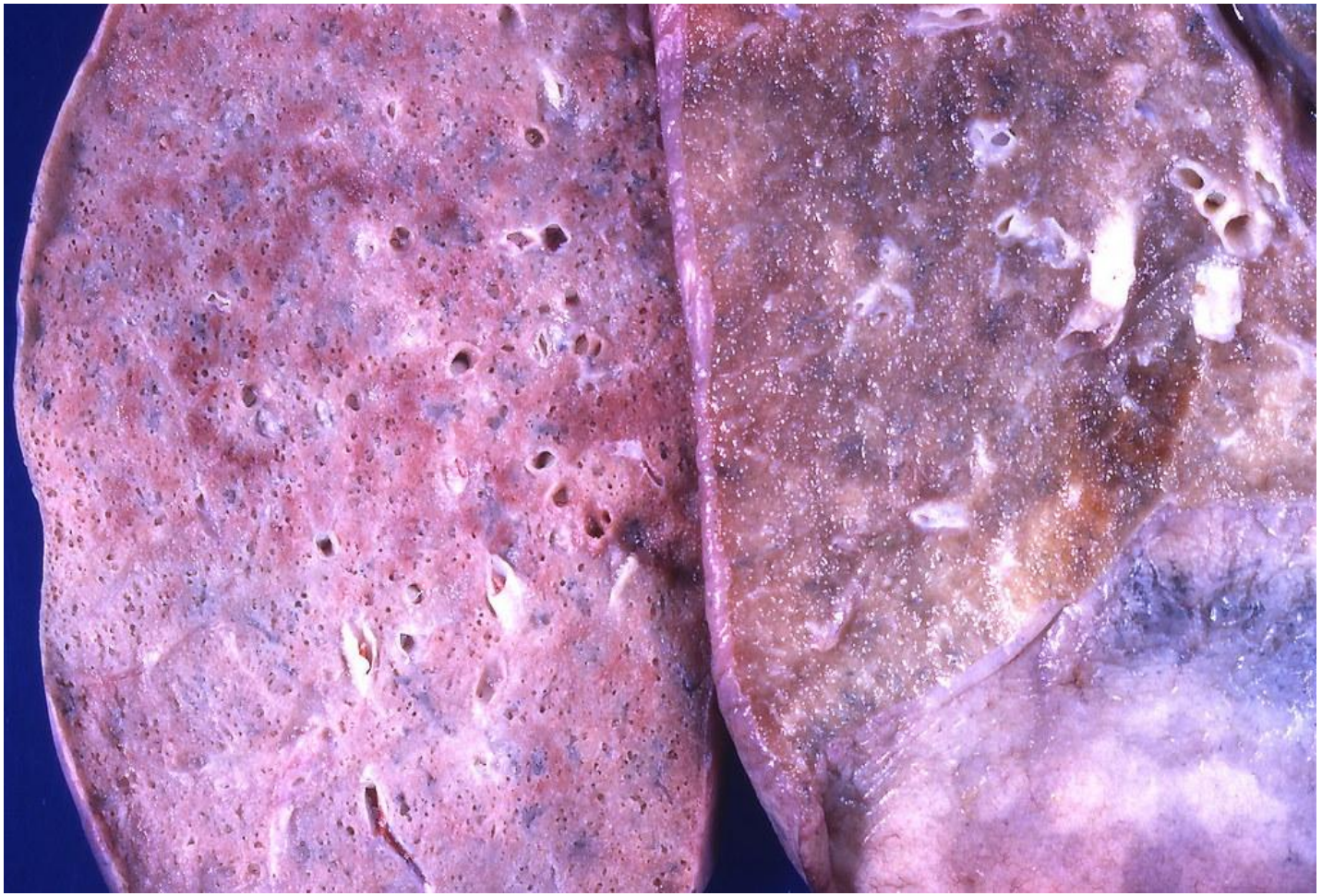


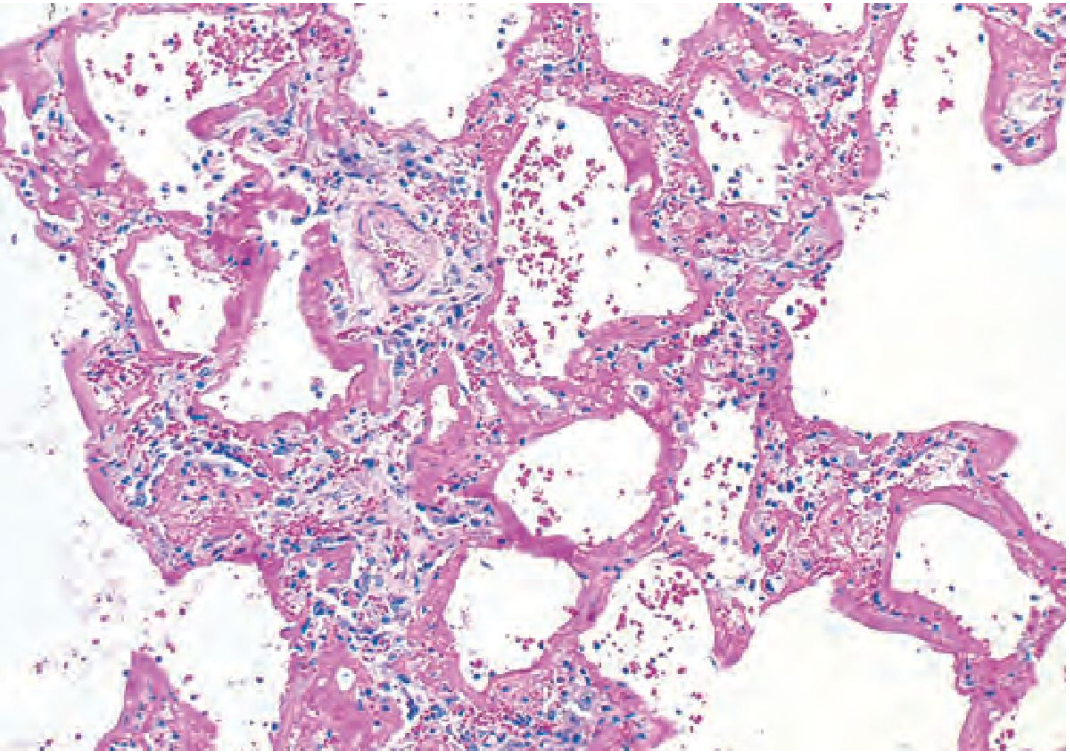
CXR:- pulmonary edema ,showing diffuse bilateral infiltration .

The histologic manifestation of these diseases (Both ARDS- and ALI) are associated with inflammation (endothelial and epithelial cell lesion) in which increases vascular permeability , diffuse alveolar damage (DAD), loss of surfactant, too much fluid in your lungs can lower the amount of oxygen or increase the amount of carbon dioxide .in your bloodstream

Grossly

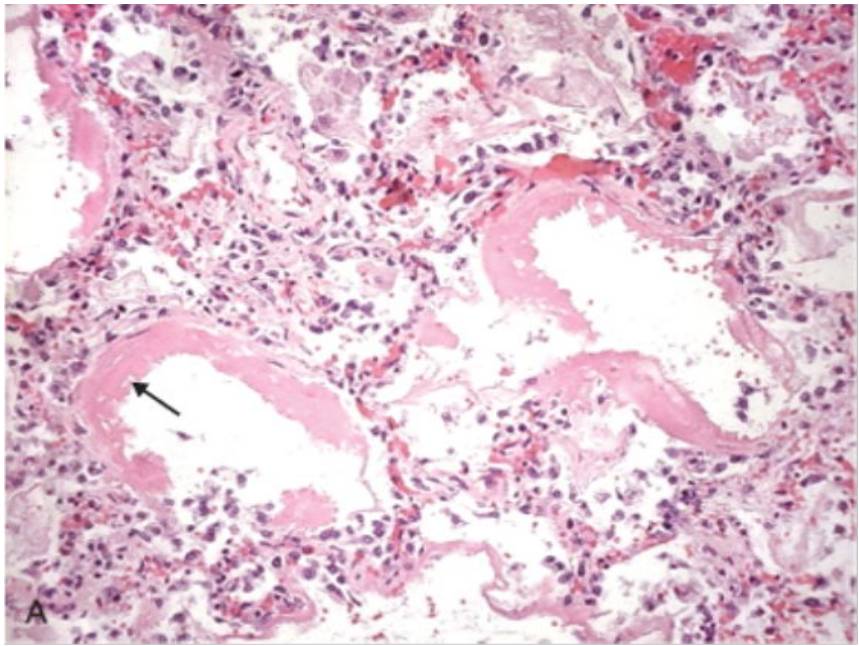
In the acute stage, the lungs are heavy, firm, red, and boggy.

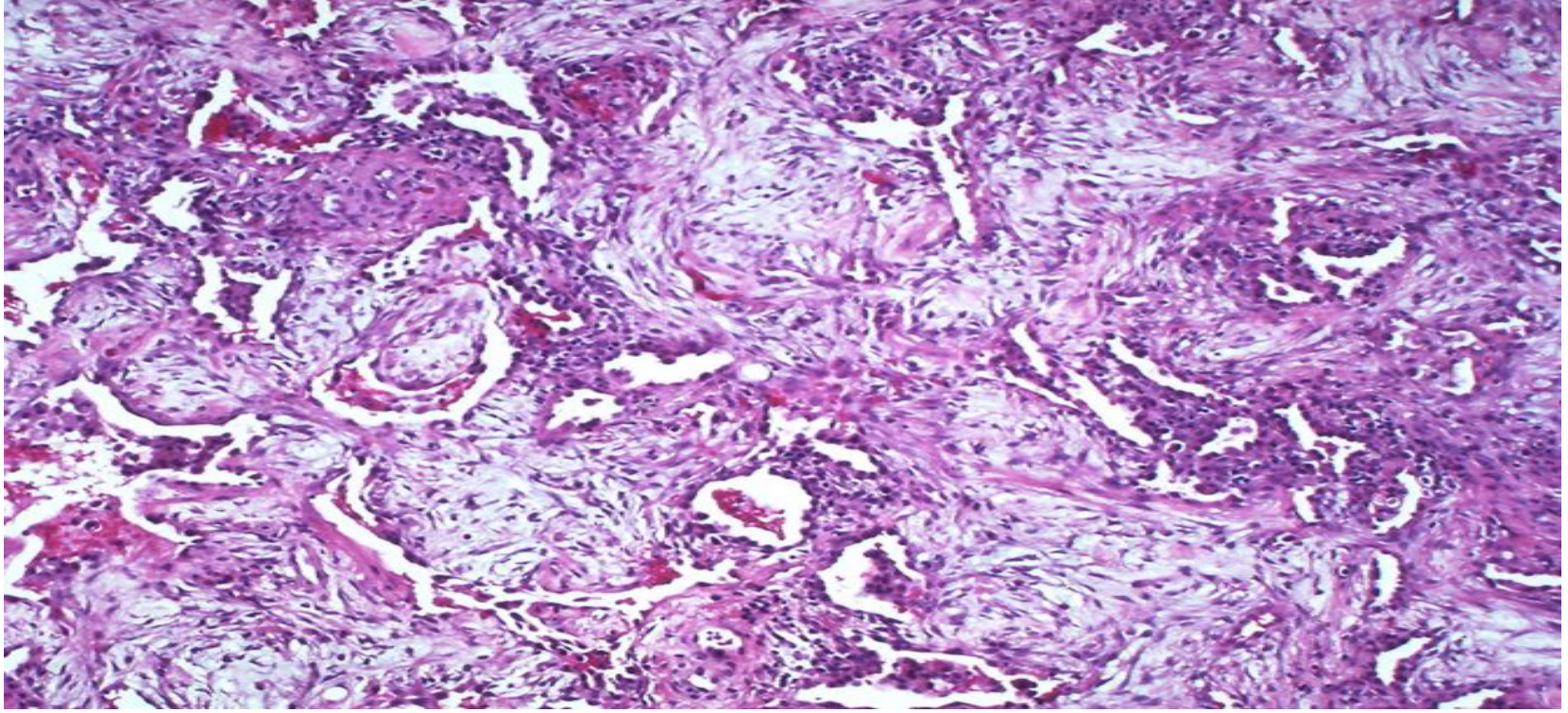




In early stage (acute phase) of ARDS

.Diffuse alveolar damage
Some of the alveoli are collapsed, while others are distended (the inspissated protein-rich edema fluid). The most characteristic finding is the presence of hyaline ,membranes





In the organizing stage(chronic phase)

Granulation tissues and fibrotic of interstitial , with type II pneumocyte hyperplasia alveolar , spaces

Prognosis

In case of resolution ---- good prognosis (return of alveolar function to normal or near normal)

while in case of fibrosing alveolitis and interstitial fibrosis , and pulmonary hypertension , therapy difficult ,and ARDS is frequently fatal , Because of , the high concentration of oxygen that are required to treat ARDS can themselves contribute to lung damage (oxygen toxicity).

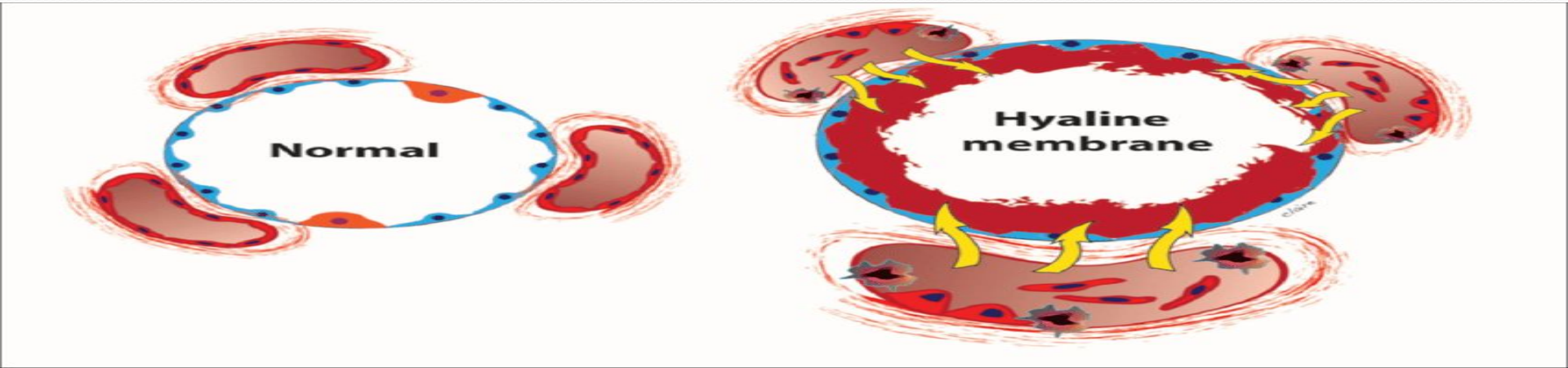
The usual cause of death is either respiratory failure or multi organ dysfunction (due to the systemic effect of the same mediators that are produced in the lung)

Respiratory Distress Syndrome of the Newborn or infant RDS (IRDS)or called (hyaline membrane disease)

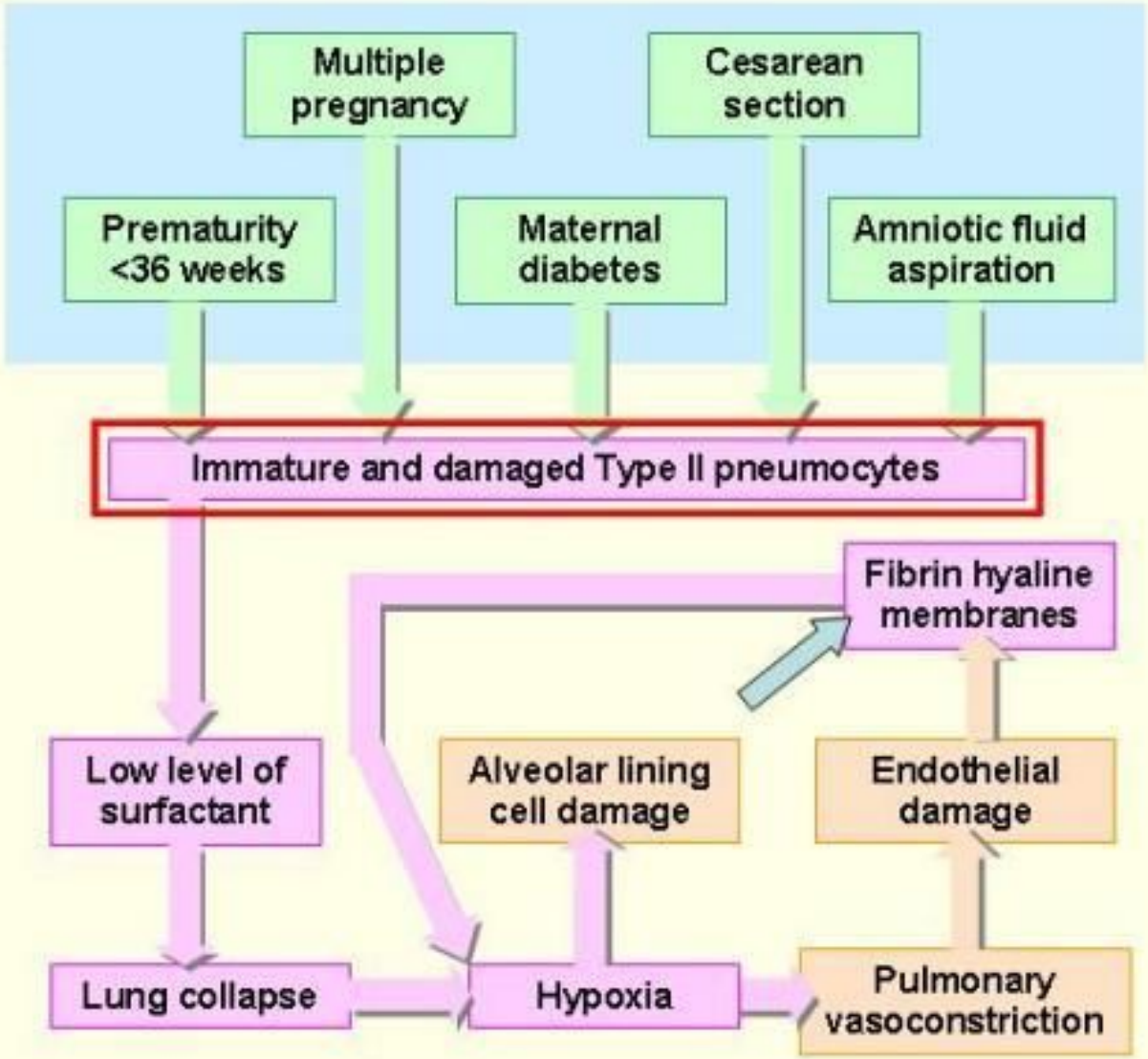
RDS is a syndrome in premature infant and manifested after 6h after birth caused by developmental insufficiency of pulmonary surfactant production results from immaturity of the lung at birth, usually because of severe prematurity.

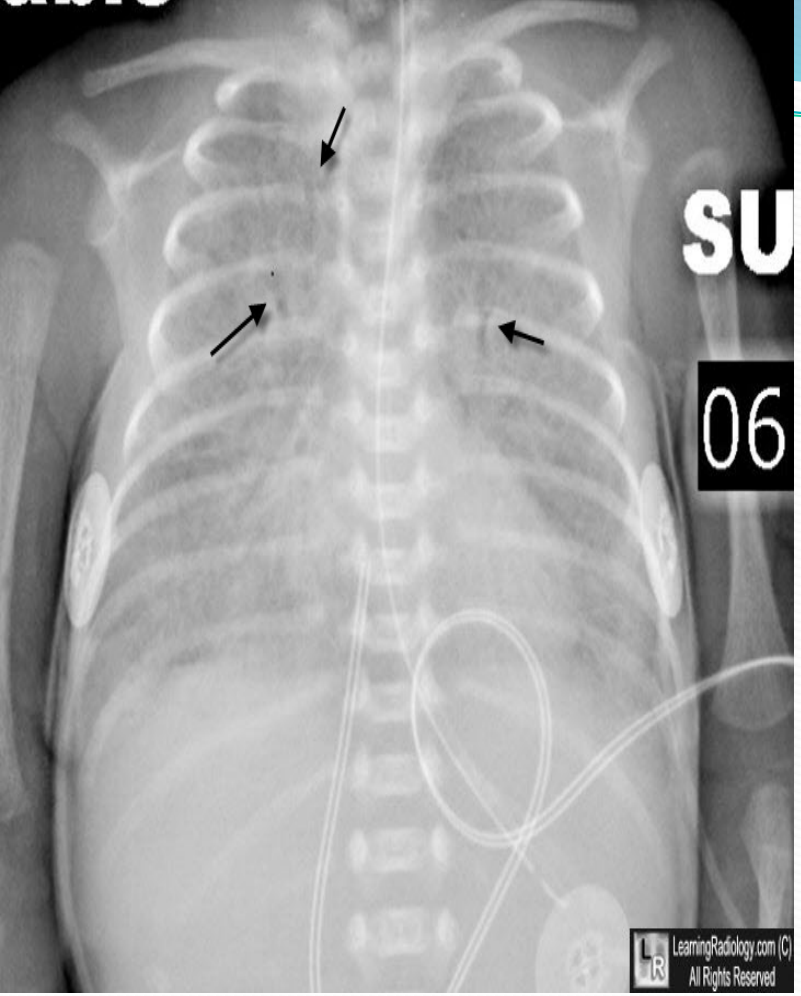
-The disorders is more common in premature infants (less than 36wk) born about 6ws or more before full term(at 34wk or 35wk and often before 28wk of pregnancy) .

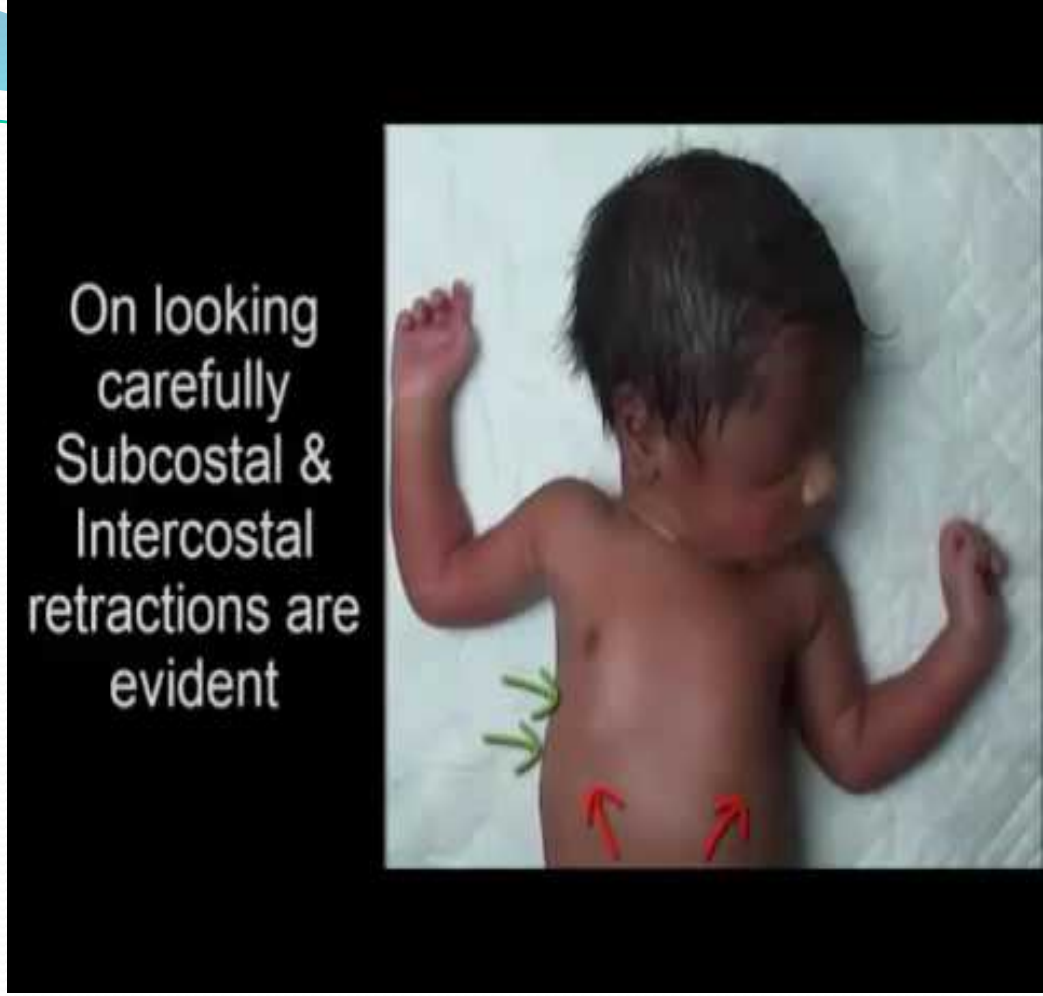
-RDS rarely occurs in full-term infants .



Pathogenesis of Hyaline Membrane Disease

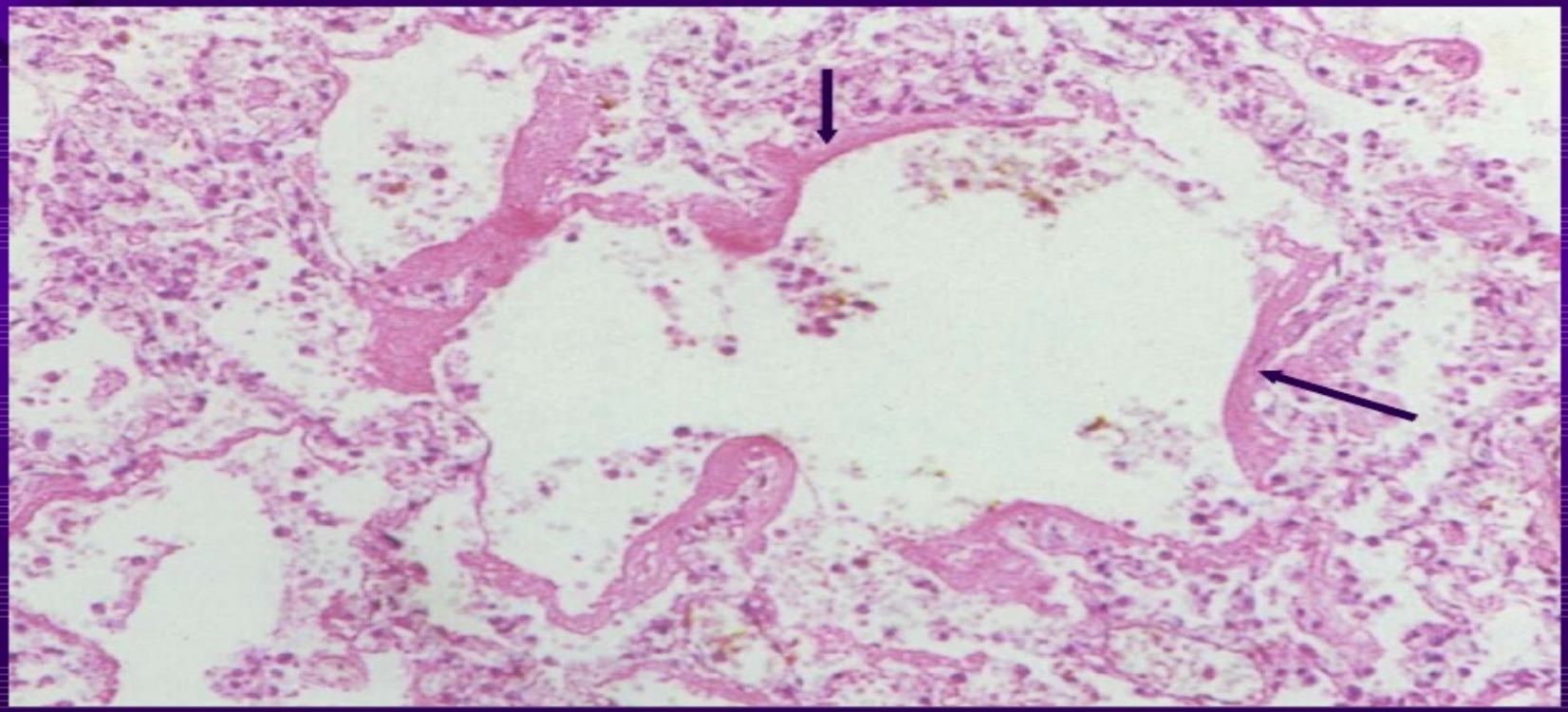






Diffuse ground-glass appearance to both lungs with .multiple air bronchograms (black arrows)

Hyaline membrane



Many alveoli are distended by inspissated protein-rich edema fluid and lined by hyaline membranes (debris from dead alveolar epithelial cells organize into hyaline membranes)

The advent of surfactant replacement therapy and improvements in ventilatory techniques have improved survival and decreased the frequency of complications of NRDS in older premature infants, but very premature infants may still develop broncho-pulmonary dysplasia .(BPD)

RDS is a leading cause of RF in preterm neonates

Clinical and epidemiologic studies demonstrate that ALI/ARDS resolves and return of alveolar function to normal or near normal in some patients, whereas in others there is persistence and/or progression of .injury

The outcomes of persistence and progression include multiple organ failure, fibrosing alveolitis, pulmonary vascular obliteration .with pulmonary hypertension, and death

ALI/ARDS is more common and associated with a worse prognosis in .chronic alcoholics and smokers

Genetic studies have identified a number of genes that increase the .risk of ARDS

Thank you

I hope you learned something from my presentation

QUIZ

y old woman with acute on chronic renal 60 failure , rushed to emergency room , and presented with sever dyspnea ,TC, TP , Cyanosis , hypoxemia

. On CXR showing diffuse bilateral infiltration

dx-1

pathophysiology -2

QUIZ

y old man with, sever type of pancreatitis rushed 60 to emergency room , and presented with sever dyspnea , TC, TP , Cyanosis , hypoxemia

. On CXR showing diffuse bilateral infiltration

dx-1

pathophysiology -2