

## Diagnostic approach to the patient with dyspnea

- Dyspnea: Difficult or impaired breathing. An abnormal and uncomfortable awareness of breathing. Shortness of breath, sense of discomfort
- Normal person at rest breaths from 8 to 16 times /min with a tidal volume of 400 to 800 ml
- Acute dyspnea Vs chronic dyspnea
- The clinical history may suggest a likely cause or differential diagnosis for the patient with diagnosis
- Physical examination: Rales, rhonchi, rubs and wheezes each occur in a variety of illnesses
- Ancillary data: CXR, ECG, ABG, CBC/DC, Chest CT and invasive procedure

## Diagnostic consideration

- Congestive heart failure
- Cardiogenic pulmonary edema
- Myocardial ischemia and infarction
- Valvular heart disease
- Cardiomyopathy
- Congenital heart disease
- Low cardiac output syndrome
- Chronic obstructive pulmonary disease
- Asthma
- Pulmonary embolism
- Spontaneous pneumothorax
- Pleural effusion
- Pneumonia and other thoracic infections
- Thoracic neoplasms
- Pulmonary hypertension
- Interstitial pulmonary disease
- Trauma

## Congestive heart failure

- The earliest manifestation of left-side CHF is dyspnea on exertion which is a response to increased interstitial pulmonary water
- In some patients, bronchospasm may develop because of pulmonary congestion. This cardiac asthma with wheezing may occur only on exertion, paroxysmally at night, or as an early manifestation of pulmonary edema
- The orthopnea in COPD is sometimes differentiated from that in CHF based on the time of onset
- The acute attack of paroxysmal nocturnal dyspnea is often triggered by coughing, abdominal distension, the hyperpneic phase of Cheyne-Stokes respiration, a startling noise, or another event that causes a sudden increase in heart rate and a further elevation of pulmonary venous and capillary pressures.
- Nonproductive cough, as a manifestation of pulmonary congestion, frequently occurs during an attack of PND or as an early sign of developing CHF

- Trepopnea is dyspnea that occurs only when the patient is in the left or right lateral decubitus position
- Platypnea is dyspnea that occurs only when the patient is in the upright position

## Cardiogenic pulmonary edema

- Differentiation between cardiac and noncardiac causes of pulmonary edema is often difficult
- Left ventricular dysfunction or occasionally to mitral or aortic valve disease
- Sudden onset of dyspnea and cough and may produce frothy, blood-tinged sputum
- Noncardiogenic pulmonary edema can be classified as permeability edema and result from damage to the alveolar epithelium, the pulmonary capillary walls, or both
- Severe permeability edema and results in the ARDS, drugs, medications, toxins, infection, near-drowning, inhalation injury, hypotension, hypoxia, central nervous system trauma or disease, and high-altitude illness are some causes of permeability edema

## Myocardial ischemia and infarction

- Patients with angina may interpret their substernal discomfort as breathlessness or an inability to take a deep breath
- Actual dyspnea at rest or with effort may be caused by an acute decrease in the left ventricular compliance secondary to a global form of myocardial ischemia
- Myocardial infarction in elderly patients presents in the classic manner in less than one-half of the cases. A frequent initial manifestation is sudden dyspnea or exacerbation of chronic CHF. Further initial signs and symptoms of myocardial infarction among the aged include acute confusion, dizziness, syncope, and stroke

## Valvular heart disease

- Dyspnea in patients with mitral stenosis results from elevation of left atrial end-diastolic pressure and thus pulmonary capillary pressure
- A rapid ventricular rate with atrial fibrillation may cause acute dyspnea
- Patients with acute aortic regurgitation, e.g. Endocarditis, aortic dissection, or trauma to the heart may suffer dyspnea due to increased pulmonary venous pressure and resulting pulmonary edema
- Tricuspid regurgitation may be associated with dyspnea on exertion. In patients with pulmonic stenosis, inadequate cardiac output during exercise can induce dyspnea without pulmonary congestion

## Cardiomyopathy

- Dyspnea and easy fatigability are common symptoms in patients with dilated, hypertrophic, or restrictive cardiomyopathies
- Dyspnea is due to increased left ventricular end-diastolic pressures, which induce elevated pulmonary venous pressures and pulmonary congestion.
- Dyspnea on exertion is often a rapidly progressive symptom

## Congenital heart disease

- Related to hypoxemia caused by a right-to-left shunt

## Low cardiac output syndrome

- Left-sided or right-sided CHF. Manifestations include easy fatigability and loss of lean muscle weight, which often results in cardiac cachexia
- Significant reduction in cardiac output in the absence of pulmonary congestion
- Lethargy, lightheadedness and confusion due to reduced cerebral blood flow, and oliguria and prerenal azotemia due to diminished kidney perfusion

## Chronic obstructive pulmonary disease

- Activity is only minimally limited until the value for the forced expiratory volume in 1 second ( FEV1) falls below 65 percent of normal
- Superimposed respiratory infection, a pneumothorax, or atelectasis may precipitate a sudden exacerbation

## Asthma

- Unlike the predictable exertional dyspnea of COPD, the dyspnea typical of asthma is episodic, with exacerbations and remissions.
- Correlates primarily with the severity of airflow obstruction

## Pulmonary embolism

- Pleuritic chest pain implies the development of pulmonary infarction combined tachycardia or Af.
- Dyspnea may be related to a sudden increase in alveolar dead space
- Prolonged immobilization, recent surgery, CHF, or recent trauma to the lower extremities
- A previous history of thrombophlebitis, women taking oral contraceptives, sickle cell anemia
- CXR, ECG , D-dimer

## Spontaneous pneumothorax

- Sudden onset of dyspnea
- Underlying lung disease, trauma

## Pleural effusion

- More severe if the effusion is large or has collected rapidly
- Treatment as underlying disease

## Pneumonia and other thoracic infections

- The most common presenting manifestations of empyema are fever, chest pain, cough, and dyspnea
- Dyspnea in patients with TB may be secondary to pleural effusion, pulmonary parenchymal involvement, or an associated anemia
- Foreign body aspiration

## Thoracic neoplasms

- Sudden dyspnea may be caused by an acute obstructive atelectasis or pneumonia
- If carcinoma is metastatic to the thorax, dyspnea is often related to ventilatory restriction due to a lung mass effect or pleural effusions

## Pulmonary hypertension

- Generally mild dyspnea on exertion without orthopnea, which can progress insidiously for months or a few years before the diagnosis

## Interstitial pulmonary disease

- Restrictive lung disease due to interstitial fibrosis
- Acute hypersensitivity pneumonitis can develop 4 to 8 hours after heavy exposure to an inhaled antigen
- Cystic fibrosis, sarcoidosis

## Miscellaneous disorders

- Partial upper airway obstruction with stridor
- Aspiration of food or foreign body
- Glottis, epiglottitis
- Laryngeal tumors and granulation tissue or fibrotic stenosis following tracheostomy or prolonged endotracheal intubation
- Injury to a phrenic nerve secondary to trauma or mediastinal tumor can cause unilateral diaphragmatic paralysis
- High-altitude pulmonary edema, with ascend rapidly to altitudes above 8000 feet
- Carbon monoxide poisoning

- Structural disorders of the thorax are usually associated with dyspnea. Severe kyphoscoliosis can interfere with ventilation sufficiently to cause chronic cor pulmonae
- Psychogenic breathlessness due to anxiety is a diagnosis of exclusion in the dyspneic patient
- Metabolic problem

## History, Physical, Ancillary Data

- The clinical history may suggest a likely cause or differential diagnosis for the patient with dyspnea
- Pneumonia. Patients with pneumonia from any cause may have cough, sputum, pleuritic chest pain, fever, and chills after a prodrome of upper respiratory tract symptoms
- Acute pulmonary embolism. Have a characteristic clinical setting. A Po<sub>2</sub> value of less than 80 mmHg in an otherwise healthy patient with dyspnea is supportive evidence for pulmonary embolism

- Spontaneous pneumothorax is more likely to occur in young, tall, thin, individuals
- Rales, rhonchi, rubs, and wheezes each occur in a variety of illnesses. Rales may be present in patients with pneumonia, CHF, or interstitial lung disease. All that wheezes is not asthma. CHF, pulmonary embolism, and foreign body aspiration can also cause wheezing. Rubs may be detected with pneumonia, pulmonary infarction, pericarditis, or pleurisy
- The radiographic findings can be diagnostic but more often suggest a differential, such as pneumothorax, pneumonia, pleural effusion, atelectasis, CHF, pulmonary edema, pulmonary contusion, aspiration and toxic gas inhalation
- ECG and cardiac enzyme
- Evidence in support of cardiac dyspnea includes the presence of third or fourth heart sounds findings of left ventricular enlargement, jugular vein distension, and peripheral edema.

## Management

- The patient with significant airways obstructive or respiratory distress requires emergent airways management to ensure adequate oxygenation and ventilation
- Upper airways obstructive secondary to foreign body aspiration, epiglottitis, angioedema, burn injury, or trauma to the face or neck may necessitate immediate intervention
- Urgency airways control may be indicated in the patient who is comatose with an unprotected airway or who is deteriorating from cardiac, respiratory, or other serious disease complication
- To achieve adequate oxygenation, the arterial Po<sub>2</sub> should be maintained > 60 mmHg and ideally > 80 mmHg. In some patient with severe COPD , a Po<sub>2</sub> of over 50 mmHg may be acceptable