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By Chris at 9:51 am, Oct 02, 2019

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cor pulmonale

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Cor Pulmonale

Definition

Cor pulmonale is an increase in bulk of the right ventricle of the heart, generally caused by chronic diseases or malfunction of the lungs. This condition can lead to [heart failure](#).

Description

Cor pulmonale, or pulmonary heart disease, occurs in 25% of patients with chronic obstructive pulmonary disease (COPD). In fact, about 85% of patients diagnosed with cor pulmonale have COPD. Chronic [bronchitis](#) and [emphysema](#) are types of COPD. High blood pressure in the blood vessels of the lungs ([pulmonary hypertension](#)) causes the enlargement of the right ventricle. In addition to COPD, cor pulmonale may also be caused by lung diseases, such as [cystic fibrosis](#), pulmonary embolism, and pneumoconiosis. Loss of lung tissue after [lung surgery](#) or certain chest-wall disturbances can produce cor pulmonale, as can neuromuscular diseases, such as [muscular dystrophy](#). A large pulmonary thromboembolism (blood clot) may lead to acute cor pulmonale.

Causes and symptoms

Any respiratory disease or malfunction that affects the circulatory system of the lungs may lead to cor pulmonale. These circulatory changes cause the right ventricle to compensate for the extra work required to pump blood through the lungs. The right ventricle has thin walls and is crescent-shaped. The resulting pressure causes the right ventricle to dilate and bulge, eventually leading to its failure.

Cor pulmonale should be expected in any patient with COPD and other respiratory or neuromuscular diseases. Initial symptoms of cor pulmonale may actually reflect those of the underlying disease. These may include chronic coughing, [wheezing](#), weakness, [fatigue](#), and shortness of breath. Edema (abnormal buildup of fluid), weakness, and discomfort in the upper chest may be evident in cor pulmonale.

Diagnosis

An electrocardiograph (EKG) will show signs such as frequent premature contractions in the atria or ventricles. Chest x rays may show enlargement of the right descending pulmonary artery. This sign, along with an enlarged main pulmonary artery, indicates pulmonary artery [hypertension](#) in patients with COPD. [Magnetic resonance imaging](#) (MRI) is often the preferred method of diagnosis for cor pulmonale because it can clearly show and measure volume of the pulmonary arteries. Other tests used to support a diagnosis of cor pulmonale may include arterial [blood gas analysis](#), pulmonary function tests, and [hematocrit](#).

Treatment

Treatment of cor pulmonale is aimed at increasing a patient's [exercise](#) tolerance and improving oxygen levels of the arterial blood. Treatment is also aimed at the underlying condition that is producing cor pulmonale.

Common treatments include **antibiotics** for respiratory infection; anticoagulants to reduce the risk of thromboembolism; and digitalis, oxygen, and **phlebotomy** to reduce red blood cell count. A low-salt diet and restricted fluids are often prescribed.

Alternative treatment

Co-management of the patient with cor pulmonale should be coordinated between the medical doctor and the alternative practitioner. The first step in treatment is to determine the cause of the condition and to evaluate all organ systems of the body. Dietary considerations, for example, a low-salt diet and reduced fluid intake aimed at reducing the edema associated with cor pulmonale, can be supportive aspects of treatment.

Prognosis

The prognosis for cor pulmonale is poor, particularly because it occurs late in the process of serious disease.

Prevention

Cor pulmonale is best prevented by prevention of COPD and other irreversible diseases that lead to heart failure. **Smoking** cessation is critically important. Carefully following the recommended course of treatment for the underlying disease may help prevent cor pulmonale.

Resources

Organizations

American Heart Association. 7320 Greenville Ave. Dallas, TX 75231. (214) 373-6300.

<http://www.americanheart.org>.

National Heart, Lung and Blood Institute. P.O. Box 30105, Bethesda, MD 20824-0105. (301) 251-1222.

<http://www.nhlbi.nih.gov>.

Key terms

Ventricle — A cavity, as in the brain or heart. The right ventricle of the heart drives blood from the heart into the pulmonary artery, which supplies blood to the lungs.

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COR [kor] (L.)

heart.

cor adipo'sum a heart that has undergone fatty degeneration or that has an accumulation of fat around it.

cor bovi'num a greatly enlarged heart resulting from a hypertrophied left ventricle.

cor pulmona'le a serious cardiac condition in which there is **right ventricular HEART FAILURE** due to pulmonary hypertension secondary to disease of the blood vessels of the lungs. Acute cor pulmonale is an emergency situation arising from a sudden dilatation of the right ventricle as a result of **pulmonary EMBOLISM**. Chronic cor pulmonale develops gradually and is associated with such chronic obstructive pulmonary diseases as EMPHYSEMA, **SILICOSIS**, and **pulmonary FIBROSIS** following an infection. These conditions impair pulmonary circulation and thus create a "damming" effect on the blood flowing through the pulmonary artery. This in turn slows down the flow of blood from the right ventricle, and the ventricle becomes hypertrophied and dilated.

Signs and symptoms are similar to those of **congestive HEART FAILURE** from other causes: **DYSPNEA**, **EDEMA** of

the lower extremities, enlargement of the liver, and distention of neck veins. The **HEMATOCRIT** is increased as the body attempts to compensate for impaired circulation by producing more erythrocytes.

TREATMENT. Treatment may involve use of drugs to decrease pulmonary vascular resistance, pulmonary **EMBOLECTOMY**, or even lung transplantation. More traditional treatments have included administration of bronchodilators and use of a mechanical ventilator to reduce hypoxia and dyspnea. For treatment of the heart failure, see **HEART FAILURE**.

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cor pul·mo·na·'le

chronic cor p. is characterized by hypertrophy of the right ventricle resulting from disease of the lungs, except for lung changes in diseases that primarily affect the left side of the heart and pulmonary artery and excluding congenital heart disease; acute cor p. is characterized by dilation and failure of the right side of the heart due to pulmonary embolism. In both types, characteristic electrocardiogram changes occur, and in later stages there is usually right-sided cardiac failure.

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cor pulmonale (kôr' pŏol'mə-nă'lē, -năl'ē, pŭl'-)

n.

Acute strain or hypertrophy of the right ventricle caused by a disorder of the lungs or of the pulmonary blood vessels.

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cor pulmonale Cardiology Right ventricular enlargement—ventricular wall ≥ 5 mm or autopsy weight of the right ventricle of > 65 g 2° to pulmonary HTN Etiology 1° lung disease—eg, pulmonary vascular disease, parenchymal defects—eg, emphysema, bronchiectasia, lungs with an abnormal ventilatory drive, and defects in the thoracic cage; in chronic CP, cardiac hypertrophy is combined with dilatation and with time evolves to CHF; in acute CP, there has only been time sufficient for cardiac dilatation; in older Pts, chronic CP is the 3rd most common cardiac disorder after ASHD and HTN; given its relation to cigarette smoking, CP is more common in ♂ Medical management Supplementary O₂, corticosteroids, anticoagulants, vasodilators, other therapy for underlying lung disease Surgical management Some Pts are candidates for lung and heart-lung transplantation

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cor pul·mo·na·le (kōr pul-mō-nā'lē)

Chronic cor pulmonale is characterized by hypertrophy of the right ventricle resulting from disease of the lungs; acute cor pulmonale is characterized by dilation and failure of the right side of the heart due to

pulmonary embolism. In both types, characteristic electrocardiogram changes occur, and in later stages there is usually right-sided cardiac failure.

Medical Dictionary for the Health Professions and Nursing © Farlex 2012

cor pulmonale A heart disorder caused by a rise in the resistance to the passage of blood through the lungs from conditions such as chronic bronchitis, **EMPHYSEMA**, **SILICOSIS** or **INTERSTITIAL FIBROSIS**. The result is enlargement of the main pumping chamber (ventricle) on the right side and often right **HEART FAILURE**.

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Cor Pulmonale

DRG Category:	315
Mean LOS:	4 days
Description:	MEDICAL: Other Circulatory System Diagnoses With CC

Cor pulmonale is right-sided hypertrophy of the heart caused by pulmonary hypertension. Cor pulmonale is estimated to cause approximately 5% to 7% of all types of heart disease in adults, and chronic obstructive pulmonary disease (COPD) due to chronic bronchitis or emphysema is the causative factor in more than 50% of people with cor pulmonale. It causes increases in pulmonary resistance, and as the right side of the heart works harder, the right ventricle hypertrophies. An increase in pulmonary vascular resistance is the result of anatomic reduction of the pulmonary vascular bed, pulmonary vasoconstriction, or abnormalities of ventilatory mechanics.

A number of physiological changes lead to poor gas exchange. Alveolar wall damage results in anatomic reduction of the pulmonary vascular bed as the number of pulmonary capillaries are reduced and the vasculature stiffens from pulmonary fibrosis. Constriction of the pulmonary vessels and hypertrophy of vessel tissue are caused by alveolar hypoxia and hypercapnia. Abnormalities of the ventilatory mechanics bring about compression of pulmonary capillaries. Cor pulmonale accounts for approximately 25% of all types of heart failure. Complications of cor pulmonale include biventricular heart failure, hepatomegaly, pleural effusion, and thromboembolism related to polycythemia.

Causes

Cor pulmonale is produced by a number of other pulmonary and pulmonary vascular disorders but primarily by acute respiratory distress syndrome (ARDS) and pulmonary embolism. Two factors in ARDS lead to right ventricular overload: the disease itself and the high transpulmonary pressures that are needed to treat ARDS with mechanical ventilation. In the United States, 50,000 deaths per year from pulmonary emboli occur, and almost half occur within the first hour due to right heart failure. Other conditions can also lead to cor pulmonale. Respiratory insufficiency—such as chest wall disorders, upper airway obstruction, obesity hypoventilation syndrome, and chronic mountain sickness caused by living at high altitudes—can also lead to the disease. It can also develop from lung tissue loss after extensive lung surgery. A contributing factor is chronic hypoxia, which stimulates erythropoiesis, thus increasing blood viscosity. Cigarette smoking is also a risk factor.

Genetic considerations

No clear genetic contributions to susceptibility have been defined.

Gender, ethnic/racial, and life span considerations

Middle-aged to elderly men are more likely to experience cor pulmonale, but incidence in women is increasing. In children, cor pulmonale is likely to be a complication of cystic fibrosis, hemosiderosis, upper airway obstruction, scleroderma, extensive bronchiectasis, neurological diseases that affect the respiratory muscles, or abnormalities of the respiratory control center. No racial or ethnic considerations are known.

Global health considerations

Prevalence of cor pulmonale depends on the prevalence of cigarette smoking and other tobacco use, air pollution, toxic exposure, and other risk factors for lung diseases. Global data are not available.

Assessment

History

Determine if the patient has experienced orthopnea, cough, fatigue, epigastric distress, anorexia, or weight gain or has a history of previously diagnosed lung disorders. Ask if the patient smokes cigarettes, noting the daily consumption and duration. Ask about the color and quantity of the mucus the patient expectorates. Determine the amount and type of dyspnea and if it is related only to exertion or is continuous.

Physical examination

The patient may appear acutely ill with **severe dyspnea at rest** and visible **peripheral edema**. Observe if the patient has difficulty in maintaining breath while the history is taken. Evaluate the rate, type, and quality of respirations. Examine the underside of the patient's tongue, buccal mucosa, and conjunctiva for signs of central cyanosis, a finding in congestive heart failure. Oral mucous membranes in dark-skinned individuals are ashen when the patient is cyanotic. Observe the patient for dependent edema from the abdomen (ascites) and buttocks and down both legs.

Inspect the patient's chest and thorax for the general appearance and anteroposterior diameter. Look for the use of accessory muscles in breathing. If the patient can be supine, check for evidence of normal jugular vein protrusion. Place the patient in a semi-Fowler's position with his or her head turned away from you. Use a light from the side, which casts shadows along the neck, and look for jugular vein distention and pulsation. Continue looking at the jugular veins and determine the highest level of pulsation using your fingers to measure the number of finger-breadths above the angle of Louis.

While the patient is in semi-Fowler's position with the side lighting still in place, look for chest wall movement, visible pulsations, and exaggerated lifts and heaves in all areas of the precordium. Locate the point of maximum impulse (at the fifth intercostal space, just medial of the midclavicular line) and take the apical pulse for a full minute. Listen for abnormal heart sounds. Hypertrophy of the right side of the heart causes a delayed conduction time and deviation of the heart from its axis, which can result in dysrhythmias. With the diaphragm of the stethoscope, auscultate heart sounds in the aortic, pulmonic, tricuspid, and mitral areas. In cor pulmonale, there is an accentuation of the pulmonic component of the second heart sound. The S3 and S4 sounds resemble a horse gallop. The presence of the fourth heart sound is found in cor pulmonale. Auscultate the patient's lungs, listening

for normal and abnormal breath sounds. Listen for bibasilar rales and other adventitious sounds throughout the lung fields.

Psychosocial

The patient has had to live with the anxiety of shortness of breath for a long time. Chronic hypoxia can lead to restlessness and confusion, and the patient may seem irritated or angry during the physical examination.

Diagnostic highlights

Test	Normal Result	Abnormality With Condition	Explanation
Chest x-rays	Normal heart size and clear lungs	Enlarged right ventricle and pulmonary artery; may show pneumonia	Demonstrate right-sided hypertrophy of heart and possibly pulmonary infection with other underlying pulmonary abnormalities
Electrocardiogram (ECG)	Normal electrocardiographic wave form with P, Q, R, S, T waves	To reveal increased P-wave amplitude (P-pulmonale) in leads II, III, and a ventricular failure seen in right-axis deviation and incomplete right bundle branch block	Changes in cardiac conduction due to right-sided hypertrophy
Echocardiography	Normal heart size	To show ventricular hypertrophy, decreased contractility, and valvular disorders in both right and left ventricular failure	Demonstrates heart hypertrophy and tricuspid valve malfunction if present

Other Tests: Magnetic resonance imaging; ultrafast, ECG-gated computed tomography scanning; ventilation/perfusion (V/Q) lung scanning; complete blood count, coagulation profile, arterial blood gases; brain natriuretic peptide (may be elevated due to elevated pulmonary hypertension and right-sided heart failure)

Primary nursing diagnosis

Diagnosis

Decreased cardiac output related to an ineffective ventricular pump

Outcomes

Cardiac pump: Effectiveness; Circulation status; Tissue perfusion: Abdominal organs and peripheral; Vital sign status; Electrolyte and acid-base balance; Endurance; Energy conservation; Fluid balance

Interventions

Cardiac care; Circulatory care: Mechanical assist device; Fluid/electrolyte management; Medication administration; Medication management; Oxygen therapy; Vital signs monitoring

Planning and implementation

Collaborative

The patient with an acute exacerbation of cor pulmonale requires mechanical ventilation and is usually admitted to an intensive care unit. Patients admitted with heart failure related to ARDS or pulmonary embolism who require specialized treatment, such as hemodynamic monitoring, may also be admitted to a special care unit.

Specific medical treatment for cor pulmonale consists of reversing hypoxia with low-flow oxygen. In the case of acute cor pulmonale associated with pulmonary emboli, higher concentrations of oxygen may be used. The physician seeks to correct fluid, electrolyte, and acid-base disturbances and may prescribe fluid and sodium restrictions to reduce plasma volume and the work of the heart. Phlebotomies may be used to reduce a patient's seriously elevated hemoglobin. Single-lung or double-lung transplantation may be considered for people with terminal disease.

SUPPORTIVE CARE. Respiratory therapists provide bronchodilator therapy and may need to teach or reinforce the patient's use of breathing strategies. Therapists may also teach energy conservation. A dietitian confers with the patient and family about the need for low-sodium foods and small, nutritious servings. Specific nutritional deficiencies may need to be corrected as well. Fluids need to be limited to 1,000 to 1,500 mL per day to prevent fluid retention. Social service agencies will probably be needed for a consultation as well because cor pulmonale creates long-term disability with the likelihood that the patient has not been employed for some time. Unless the patient is old enough to receive Medicare, hospitalization costs are a serious concern.

Pharmacologic highlights

Medication or Drug Class	Dosage	Description	Rationale
Calcium channel blockers	Varies with drug	Nifedipine, diltiazem	Lower pulmonary pressures
Bronchodilators	Varies with drug	Beta2-adrenergic agonists, anticholinergics	Relieve bronchospasm
Antibiotics	Varies with drug	Trimethoprim, sulfamethoxazole, amoxicillin are examples	Manage respiratory infections

Other Drugs: Acute cor pulmonale with acute right ventricular failure may require fluid loading and vasoconstrictors such as epinephrine administration. Massive pulmonary embolism may require thrombolytic agents. Oxygen therapy, diuretics, vasodilators, low-dose digitalis, theophylline, antidysrhythmic agents, and anticoagulation therapy may be used in long-term management.

Independent

The patient requires bedrest and assistance with the activities of daily living if hypoxemia and hypercapnia are severe. Provide meticulous skin care. Reposition the bedridden patient frequently to prevent atelectasis. Reinforce proper breathing strategies for the patient: breathe in through the nose and out slowly through pursed lips, using abdominal muscles to squeeze out the air; inhale before beginning an activity and then exhale while doing the activity, such as walking or eating.

Nurses can teach patients to control their anxiety, which affects their breathlessness and fear. Teach the patient the use of relaxation techniques. Because patients are continually breathless, they become anxious if they feel rushed; focus on providing a calm approach. Help reduce the patient's fear of exertional dyspnea by providing thoughtful care that builds trust. Encourage the patient to progress in small increments.

Because of the exertion that talking requires, many patients with cor pulmonale may not be able to respond adequately in conversation. Try to understand the patient's reluctance to "tire out" and become familiar with reflective techniques that allow a patient to respond briefly. Integrate your teaching into the care to avoid the need to give the patient too much information to assimilate at the time of discharge.

Evidence-Based Practice and Health Policy

Boissier, F., Katsahian, S., Razazi, K., Thille, A.W., Roche-Campo, F., Leon, R., ...Dessap, A.M. (2013). Prevalence and prognosis of cor pulmonale during protective ventilation for acute respiratory distress syndrome. *Intensive Care Medicine*, 39(10), 1725–1733.

A study among 226 patients with ARDS revealed cor pulmonale in 22% (95% CI, 16% to 27%).

A greater proportion of patients with cor pulmonale (79.6%) had infection-related lung injuries compared to patients without (57.6%) ($p < 0.01$). Having an infection-related lung injury was associated with a 2.87 ($p < 0.01$) increased risk of cor pulmonale.

In this sample, 28-day mortality rates were higher among patients with cor pulmonale (60%) than patients without (30%) ($p < 0.01$).

Documentation guidelines

Physical findings: Vein distention, presence of peripheral edema, cardiopulmonary assessment

Responses to activity, treatments, and medications

Understanding of and willingness to carry out prescribed therapy

Discharge and home healthcare guidelines

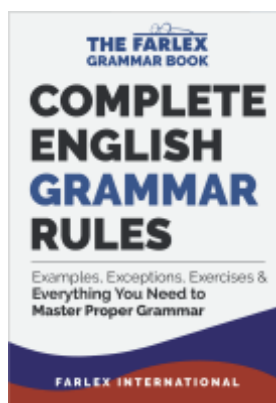
COMPLICATIONS. Teach the patient and family the signs and symptoms of infection, such as increased sputum production, change in sputum color, increased coughing or wheezing, chest pain, fever, and tightness in the chest. Teach the patient how to recognize signs of edema. Make sure the patient knows to call the physician upon recognizing these signs.

MEDICATIONS. Be sure the patient understands any pain medication prescribed, including dosage, route, action, and side effects.

NUTRITION. Explain the importance of maintaining a low-sodium diet. Review nutrition counseling and the prescribed fluid intake.

ONGOING OXYGEN THERAPY. If the patient is going home with low-flow oxygen, ensure that an appropriate vendor is contacted. Determine whether a home care agency needs to evaluate the home for safety equipment and pollution factors.

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