

A Discussion Of Normal And Abnormal Physiology In Tuberculosis

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Introduction

The diagnostic findings and symptoms from the reports indicate that the patient had developed pulmonary Tuberculosis that infected the lungs. Tuberculosis, or TB, is a disease that is curable and preventable, but on average, it leads to more fatalities than any other infection. A lot of patients with TB remain undiagnosed, whereas it is often the case that a patient experiences contagious illness for weeks or months before he is diagnosed with this disease. To diagnose TB, two main tests are used to detect the bacteria that cause this infection in the body: TB Blood tests and TB skin tests TST. If the patient tests positive in one of these tests, it indicates that he or she has been infected, but the tests cannot predict whether the patient has progressed to TB disease or has latent TB infection (LTBI). Another test is the IGRA, an interferon-gamma release assay to test the patient's blood for more accurate results.

TB is passed via droplets to other people. If the patient sneezes, coughs or talks, the mucus or saliva droplets from that person's mouth or nose expel into the air that the other person could inhale, possibly leading to an infection. The usual symptoms exhibited include a chronic cough that contains sputum with blood, along with night sweats, high fever and weight loss (Marcel Bruins, 2013). Although it may infect any part of the body, but occurs typically in the lungs, for which it is labeled pulmonary tuberculosis.

Normal Physiology Of The Affected Organ

The human body contains a pair of organs located in the chest, below the rib cage on both sides of the heart, known as the lungs. Their main function is an exchange of carbon dioxide and oxygen between the blood and the air humans breathe in. Lungs are approximately coned-shaped, roundly pointed at the apex, and the base is flat where they connect to the diaphragm. The lungs are divided into parts known as lobes, two on the left side and three on the right side. For each lung, the trachea breaks into two major bronchi. Furthermore, bronchi break into smaller and smaller tubes, which end up in air sacks known as alveoli, the place where the gas exchange process happens. This air movement keeps on dividing into smaller tubes, which eventually link with small air sacs known as alveoli. This recurring splitting of tubes is called the tracheobronchial "tree" due to the resemblance of a splitting of tubes with the branch splitting of a tree (Levitzky, 2013).

The main function of the lungs is to take air from the environment and transfer this oxygen into the

bloodstream, which then passes it to the whole body. Lungs don't have a muscular structure, so the process of breathing depends upon the power of the diaphragm. Breathing needs muscle contraction, and vault-shaped like muscle known as the diaphragm situated under the lungs helps in the reparation process. The diaphragm divides the abdominal cavities and the chest. When the diaphragm contracts. It compresses out, moving near the abdominal cavity. A vacuum is created with this action, which leads to the enlargement of the chest cavity. The nose or mouth is used to suck the air. In contrary to inhalation, exhalation does not need muscle contraction. During the exhaling process, the enlarged lung behaves like an expanded rubber band and comes back to its original position.

This shrinkage of the lungs pushes air out of the lungs and into the mouth. Environmental air should be moistened and warm to equalize the body's humidity and temperature. Air gets warmed, and water is added when air moves down the tracheobronchial tree. Impurities should also be removed. Tiny microscopic hairs and nose hairs are known as cilia, besides stick mucus formed by lining membrane aid in cleaning the impurities of the air. Cilia vibrate in a synchronized way cleaning mucus and collected dirt up to the mouth. The collected stuff is then swallowed or coughed out. Once the air enters the alveoli, it is nearly sterile. In spite of the fact that respiration is the well-known function of the lungs, they accomplish other tasks, too (Levitzky, 2013).

Pathophysiology

Droplet nuclei or small airborne droplets are primarily responsible for spreading mycobacterium tuberculosis. These are generated by the infected person's sneezing, coughing, talking or singing, who is generally suffering from laryngeal or pulmonary tuberculosis. The tiny droplets released as a result of expectoration can remain in the air for up to hours at times. As Mycobacterium tuberculosis is introduced into the lungs, the respiratory system gets infected. These bacteria can also spread to other parts of the body, such as pleura, lymphatics, meninges or joints/bones, that can lead to extrapulmonary tuberculosis. The infectious droplets settle through the lung's airways once these are inhaled, with the majority of bacilli remaining trapped at the upper parts of the airway where goblet cells that secrete mucus exist. Foreign substances are caught by the mucus that is produced in the area, and the cell surface, which has the cilia, constantly beats the mucus upward for removal along with its other entrapped particles (Knechel, 2009).

This system is the body's initial line of physical defense against the infection that helps prevent it in most people who get exposed to the tuberculosis bacteria. When the droplets that are laden with bacteria reach the alveoli, bypassing the mucociliary system, they become quickly engulfed and surrounded by alveolar macrophages. In the alveolar spaces, these immune effector cells are present most abundantly. These macrophages are part of the innate immune system and act as the next line of defense for the host and provide the body with another opportunity to prevent infection by destroying the invading mycobacteria. In the process of uptake of the mycobacteria, there are several macrophage receptors acting with a different mechanism that is involved. The phagocytosis of the

bacteria is also affected by the complement system.

This occurs through the C3 protein which binds itself to the cell wall and helps recognize the mycobacteria for the macrophages to attack. As a result of the macrophage action, the subsequent phagocytosis leads to a cascade of events that can either control the infection, lead to latent tuberculosis, or progress toward primary progressive tuberculosis as an active disease. The quality of host defenses determines the outcome of the infection, as well as the balance that occurs between the invading mycobacteria and host defenses (Wani, 2013). From a period of 2 to 12 weeks, the initial immune process can continue until, eventually, the microorganisms grow in sufficient numbers to stimulate a cell-mediated immune response that is detectable through the TST skin test.

References

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