

Transcript Details

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www.reachmd.com
info@reachmd.com
(866) 423-7849

Obesity and Respiratory Function: Understanding Mechanical and Functional Impacts

Announcer:

You're listening to *Clinician's Roundtable* on ReachMD. On this episode, Dr. Sujith Cherian will discuss how obesity impacts respiratory physiology, which he spoke about at the 2025 CHEST Annual Meeting. Dr. Cherian is an Associate Professor in the Divisions of Critical Care, Pulmonary, and Sleep Medicine at University of Texas Health-McGovern Medical School. He also serves as the Director of Interventional Pulmonology and Pleural Diseases at Lyndon B. Johnson Hospital in Houston. Let's hear from Dr. Cherian now.

Dr. Cherian:

So if I divide the effects of obesity on respiratory physiology, I would divide it as in terms of its effects on the respiratory mechanics, its effects on the pulmonary function tests, its effects on the lung volumes or plethysmography, its effects on the respiratory muscles, and the physiology at the basic level, which includes the gas exchange and the ventilation perfusion levels.

When I talk about its effects on the lung mechanics, obesity typically affects, broadly speaking, the compliance of the respiratory system. And that compliance typically means that it affects the chest wall, and that's typically by its effect of the adipose tissue on the chest wall. And the lung compliance is affected by the increased blood flow that all obese patients typically have, which means that increased blood volume would affect the lung compliance, which has its effects while patients are breathing—particularly when patients are breathing when they're in a supine position. And when patients are admitted and in the hospital and on the mechanical ventilator, these effects are accentuated, especially because the compliance is affected.

Now, how does it affect the lung function? And I'm going to broadly start with its effects on the spirometry. Now, typically speaking, in a patient with mild obesity, the predominant effect is really only on the expiratory flow. So the patient's forced expiratory volume in the first, second, as well as the forced volume vital capacity is affected a little bit, but the ratio as such is normal. In a patient with mild to moderate obesity, the predominant effect on the spirometry is that of a restrictive ventilatory defect. As the obesity now progresses to become morbid, there is more of an obstructive ventilatory defect, and that results from the small airway obstruction that you get as the lung volumes tend to decrease.

Now, moving forward, what is its effect on the lung volumes? The most common variable is really the expiratory reserve volume and then, consequently, the functional residual capacity. As it closes on to the closing capacity of the lung, what usually happens is that the smaller airways—and when I say smaller airways, is when the bronchioles, which are less than 2mm in diameter—the respiratory and the terminal bronchioles tend to close faster, which results in air trapping. As obesity tends to increase, patients tend to have more of an obstructive ventilatory defect.

Typically, in mild to moderate obesity, the only things which are affected are the expiratory reserve volume and the functional residual capacity, but as the obesity tends to increase, the vital capacity and the total lung capacity may also be affected in morbid obesity.

Now, what are the effects on the respiratory muscles? This relationship is a little more complicated. Most studies have not shown that it significantly affects the respiratory muscles. However, the respiratory muscle endurance is affected, and the positioning of the patients, especially in morbidly obese patients, shows that the maximal inspiratory pressure and the expiratory pressures are grossly affected when the patients are supine as against patients sitting up or in a standing position, particularly in morbidly obese patients. And this may be because of the diaphragmatic dysfunction or the length tension disadvantage that happens in these patients. The other way is with the respiratory muscle endurance—the maximal voluntary ventilation is typically affected in a lot of patients, and in obese patients, it's affected by at least 20 percent, and in patients with obesity hypoventilation syndrome, it has affected at least 45 percent.

Now, last but not least, is its effect on the gas exchange. So that is predominantly seen more commonly as the severity of the obesity tends to increase, and this is likely because of the airway closure and the alveolar collapse seen in the lower lobes, which causes the ventilation to be more preferentially towards the upper lobes and resulting in a significant ventilation-perfusion mismatch.

Announcer:

That was Dr. Sujith Cherian discussing respiratory physiology in patients with obesity. To access this and other episodes in our series, visit *Clinician's Roundtable* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening!