

CLOSING VOLUME

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Abstrak

Fungsi utama sistem pernapasan antara lain memasukkan oksigen (O_2) dari udara luar yang diteruskan ke sel tubuh dan mengeluarkan karbon dioksida (CO_2) ke udara luar. Sistem pernapasan terdiri dari paru, saluran napas konduksi, dan sistem saraf pusat. Proses pernapasan terdiri dari ventilasi, difusi, dan perfusi. Udara masuk ke paru didistribusikan ke apeks paru (*zona nondependent*) lebih besar daripada basal paru (*zona dependent*) karena gradien tekanan pleura yang dipengaruhi gravitasi. Tekanan pleura saat volume residu di *zona dependent* lebih besar daripada tekanan saluran napas intralumen menyebabkan *airway closure*. *Closing volume* (CV) adalah volume paru ketika saluran napas mulai menutup, terjadi di *zona dependent* paru saat ekspirasi. Empat fase pengukuran CV yaitu fase pengosongan ruang rugi anatomis, fase pencampuran gas ruang rugi anatomis dan alveoli, fase *alveolar plateau*, dan fase CV. Pengukuran CV mudah dilakukan dan sensitif untuk deteksi dini penyempitan saluran napas kecil. Perubahan patologi saluran napas kecil berdiameter kurang dari 2 mm menyebabkan peningkatan CV. Indikasi utama pengukuran CV antara lain untuk persiapan preoperasi. Pengukuran CV menggunakan teknik bolus dan gas *resident* (nitrogen). Faktor yang mempengaruhi pengukuran CV adalah gravitasi, laju aliran ekspirasi dan inspirasi. Kondisi atau kelainan CV dikaitkan dengan penambahan usia, obesitas, PPOK, edema paru, penyakit jantung, dan kifoskoliosis.

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Abstract

The main function of the respiratory system is incorporate oxygen (O₂) from the outside air passed to the cells of the body and remove carbon dioxide (CO₂) to the outside. The respiratory system consists of the lungs, respiratory tract conduction, and central nervous system. The breathing process consists of ventilation, diffusion, and perfusion. The air that enters the lungs are distributed to the apex of the lung (nondependent zone) is greater than basal (zone dependent) because pleural pressure gradient affected by gravity. The pleural pressure of dependent zone larger than intraluminal pressure airway when residual volume causing airway closure. Closing volume (CV) is the volume of the lungs when the airways start to close, occurs in the dependent zone during expiration. Four phases of CV measurements are emptying of anatomic dead space phase, gas mixing of anatomic dead space and alveoli phase, alveolar plateau phase, and CV phase. Closing volume measurement are easy and sensitive to early detection of a narrowing the small airways. Pathological changes of small airway diameter less than 2 mm lead to an increase in CV. The main indication of CV measurement is preoperative preparation. Closing Volume measurements are using a technique bolus and resident gas (nitrogen). The factors affecting the CV measurements are gravity, expiratory flow rate, and inspiration. The condition or disorder associated with CV are age, obesity, COPD, pulmonary edema, heart disease, and kyphoscoliosis.