atively simple, care must be taken to carry them out precisely as indicated in a previous paper. In this paper it was shown that the measurement of the airways size was highly reproducible. There are some technical points to be discussed with such a method. It has already been shown that the slices were done at exactly the same level. The method of measurement of the airways size was found to avoid operator subjectivity. Finally, although the same window level had to be used for the serial measurements of the same bronchus, variable levels were used for the different bronchi, although some authors have used a single window level for all the bronchial measurements.47

Heterogeneity of bronchial obstruction was observed after exercise challenge. Although PD20FEV1 was only observed when the majority of bronchi had a decreased caliber during challenge, large variations in bronchoconstriction of individual airways were observed. Bronchi of a similar caliber at baseline and in the same area were found to present a variable decrement in their caliber during challenge from almost no change to complete obstruction. A greater heterogeneity was observed in patients who had a decrement in FEV1 ranging from 5 to 11%. In such patients, some bronchi were even found dilated during challenge. After β2-agonist inhalation, most bronchi of asthmatic patients presented an increase in caliber, and surprisingly, it was observed that some large bronchi were completely obstructed at baseline showing the inhomogeneity of the airways obstruction in asthma.

High-resolution computed tomography can therefore be used to appreciate changes in the caliber of individual airways and may help to improve the understanding of pulmonary physiology.

REFERENCES

New Method for Real-Time Measurements of Changes in Lumenal Area of Microsection Explants of Airways by Videomicrometry*

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A new method was developed for assessing the changes in luminal area in microexplants of airways caused by pharmacologic and physiologic activation. Microairway rings were sectioned from either 18 explanted guinea pig tracheal airways or 5 human bronchial airways and placed in microchambers containing 250 µL Hanks' balanced salt solution. Tissues were focused through a stereozoom microscope, captured by video digitizing board, and transmitted continuously to the input of a video recorder. Changes in airway luminal area were assessed as changes in pixel number by image analysis software and normalized as percent area reduction. As for isometrically fixed airway in large perfusate volume, microsection of airways caused a time-related spontaneous active tone.

Within 30 min, luminal area decreased by 8.25 ± 1.56% and was greatest at 17 ± 1.45% after 60 min. This effect was blocked completely by preincubation with 10⁻⁵ M indomethacin (INDO). In 20 other preparations, 10⁻⁹ M to 10⁻⁷ M acetylcholine (ACh) caused a concentration-related decrease in luminal narrowing (38.1 ± 2.8% vs control; p<0.001) and was not affected by epithelial removal or pretreatment with INDO. Decrease in luminal narrowing (~20%) caused by either ACh or spontaneous active tone was reversed completely by β-adrenergic stimulation. Stimulus-response curves were generated using a step-down transformer through a potentiometer at constant 8V, 60Hz AC source, 10-s duration, using platinum wire electrodes. Maximal electrical field stimulation caused a ≥15% decrease in luminal narrowing; pretreatment with 10⁻⁶ M atropine completely abolished the response caused by electrical field stimulation. Similar airway responses also were observed in explanted human bronchial airway, only the spontaneous active tone was not affected by INDO. In a final series of experiments, the effect of activated eosinophils isolated from human peripheral blood was examined in human bronchial airways. Activation of cells was confirmed by superoxide anion generation. Substantial luminal narrowing (26.6 ± 3.8%) was observed for activated eosinophils vs nonactivated cells (4.3 ± 1.7%) for 10⁵ cells/chamber (p<0.001). Preincubation with A63162, a 5-lipoxygenase inhibitor, caused concentration-dependent inhibition of airway narrowing; INDO caused a lesser inhibition.

A real-time method for assessment of auxotonic changes in airway caliper is demonstrated that utilizes microsections of explanted airways and permits the use of an extremely small number of isolated eosinophils to achieve physiologic activation. Concentration-response characteristics are similar to those of large chamber preparation, and narrowing was reversed with β-adrenoceptor activation. It is also demonstrated that spontaneous tone, which previously had been attributed to isometric fixation both for guinea pig and human airways, is present in these auxotonic preparations.