Inhalation dose-response curves for methacholine as the challenge agent using the pulmonary impedance (Zrs), transcutaneous Po2 (tcPo2) and ventilation scintigra with Krypton-81m were studied for 12 subjects with bronchial asthma. The concentrations of the methacholine at the moment when three indices (Zrs, tcPo2, Kr-81m) changed, that is, the threshold levels for methacholine are compared to the correlation coefficient of threshold levels between Zrs, tcPo2 and Kr-81m were excellent.

In some cases, the abrupt increase of impedance was observed at a certain concentration of methacholine solution but tcPo2 and ventilation image by Kr-81m were not changed. The differences of regional threshold levels were apt to be inversely proportional to the slope of the pulmonary impedance curves.

From these data, it was shown that regional different responsiveness to methacholine of airway tracts seemed to influence of the dose-response curve of pulmonary impedance.

Mean upper third count decreased with oxygen inhalation to 0.862 of initial state in MVD and to 0.896 of initial state in ASD. PBFRatio decreased with oxygen inhalation from 1.027 to 0.904 in MVD and from 0.874 to 0.845 in ASD.

As a result, alternation of pulmonary blood flow was observed in mainly upper third lung field in MVD and in both upper and lower third lung field in ASD. This method can evaluate not only distribution but also alternation of pulmonary blood flow induced oxygen effect.