

Pulmonary Compliance at Increased Ambient Pressure

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The present use of hyperbaric oxygen therapy for the treatment of toxic and ischemic phenomena has provoked some thought of the possibility of the increased ambient pressure effecting the mechanics of pulmonary function. Rhesus monkeys weighing approximately 2 kg. were used in this preliminary study during which the total respiratory compliance and the change in thoracic compliance was determined at ambient pressures of zero, one and two atmospheres gauge pressure.

The monkeys were anesthetized with intravenously administered pentobarbital. A tight fitting endotracheal tube was inserted and an esophageal balloon was placed in the central one-third of the esophagus. The animal's respiration was controlled manually prior to the actual pulmonary compliance measurement to provide an opportunity for hyperventilation and expansion of the pulmonary alveoli before each series of measurements.

Inflation static pressure-volume curves of the total respiratory system and changes in thoracic compliance were determined with the monkeys in the supine position. The lungs were inflated with 25 ml. increments of air until a pressure of approximately 30 cm. of water was reached in the pulmonary system.

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Following each incremental inflation a five second equilibration period was allowed before determining the pressure in the esophageal balloon and trachea by means of water filled manometers. Each succeeding increment of air followed its predecessor by approximately 10 seconds. Static pressure-volume curves were then plotted for each animal. From these curves total respiratory system compliance and changes in pulmonary compliance were calculated.

The central portion of the pressure-volume curve was utilized in the calculation of the compliance values. In order to standardize the segment of the curve used in each instance, it was decided to utilize the values obtained between the 25 ml. and 75 ml. of air volume increase in calculating the values for total compliance. Compliance was calculated as total respiratory compliance and as change in pulmonary compliance.

Total respiratory compliance was comparable for all the monkeys at normal ambient pressure and showed no significant change when the ambient pressure was increased to one and then two atmospheres gauge pressure. The value obtained for the total respiratory compliance was 6 ml./cm. H₂O. No significant change in pulmonary compliance was noted in any monkey during this study. These values remained constant during changes of ambient pressure from zero to two atmospheres gauge pressure.

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