**Comparing Bulk Modulus and Elastance of Tracheal Tube Cuffs In-Vivo**

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The relationship between tracheal tube cuff pressure and volume has typically been examined as a function of elastance: \( E = \Delta P/\Delta V \) or compliance: \( C = \Delta V/\Delta P \). Bulk modulus is defined as the ratio of change in pressure to change in relative volume: \( B = \Delta P/(\Delta V/V_i) \). Using data from prior published studies, bulk modulus appears to offer a greater ability to discriminate between differences in tracheal tube cuff rigidity in-vivo. Furthermore, bulk modulus correlates with elastance.

**Methods**

Numerous studies have examined the compliance of various tracheal tube cuffs in-vivo which have been inflated with either room air (RA) or mixtures of oxygen and nitrous oxide. Using the data from these studies, we have been able to calculate elastance as well as bulk modulus.

**Results**

Bulk modulus has a 91.14% correlation with elastance. In addition, the standard deviation of bulk modulus \( \sigma_B \) is greater than the standard deviation of elastance \( \sigma_E \). This relationship can be described as: \( \sigma_B = \sigma_E \mu_{V_i} \). Note that \( \mu_{V_i} \) represents the mean value of the initial cuff volume. Thus, bulk modulus has more discriminative power than elastance.[figure1]

Based on these data, researchers and clinicians should consider bulk modulus as a quantitative measure when examining or comparing tracheal tube cuff stiffness.

**References**


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**Figure 1**