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Room Area F

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 σ_B is greater than the standard deviation of elastance σ_E . This relationship can be described as: $\sigma_B = \sigma_E \cdot \mu_{Vi.}$ Note that $\mu_{Vi.}$ represents the mean value of the initial cuff volume. Thus, bulk modulus has more discriminative power than elastance.[figure1] **Conclusions**

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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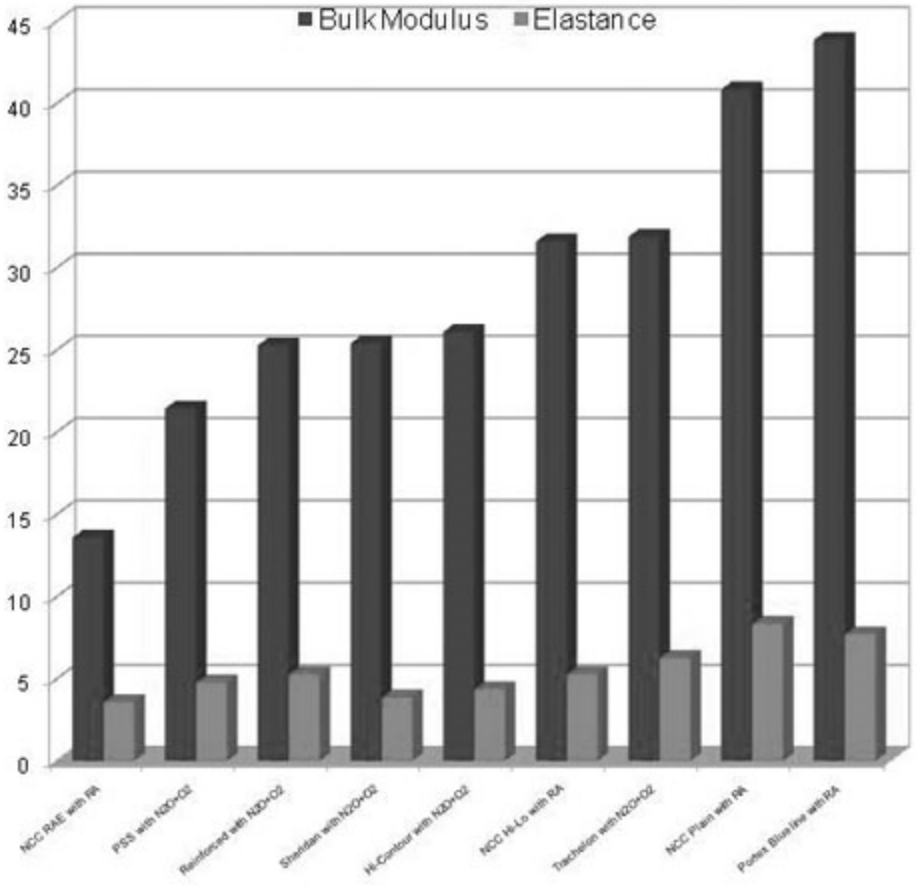
Figure 1


Bulk Modulus
Elastance
45
40
35
30
25
20
15
10
5
0
NCC RAE with RA
PSS with N2O+O2
Reinforced with N2O+O2
Sheridan with N2O+O2
Hi-Contour with N2O+O2
NCC Hi-Lo with RA
Trachelon with N2O+O2
NCC Plain with RA
Portex Blue line with RA