APPENDIX
Determination of dynamic pressure volume relations from airflow and pressure tracings

Flow scale: 1 mm = 10.9 ml/sec
Time scale: 1 mm = 0.04 sec

The pressure volume relations at definite points during the inspiratory manoeuvre were determined by marking off corresponding points \((V_0, V_1, V_2 \text{ etc.}, \text{ and } P_0, P_1, P_2 \text{ etc.})\) on the flow and pressure tracings. The volume inspired at \(V_1, V_2 \text{ etc.},\) were determined using the trapezoidal rule as follows:

Since volume = flow \(\times dt\) (where \(t\) is time), the volume of air inspired from \(V_0\) to \(V_1\) is equal to the area under the flow curve between these two points. To facilitate the measurement of this area, it was divided into 5 units, by curvilinear lines parallel to the chart lines and 1 mm apart.

Volume inspired during the first 0.04 second, i.e. the area of the first unit which is a triangle \(= \frac{54.50}{2} \times 0.04 = 1.09 \text{ ml}\) (where 54.50 is the flow at \(V_1\)). Volume inspired during the second 0.04 second i.e. the area of the second unit which is a trapezoidal figure \(= \frac{54.50 + 76.30}{2} \times 0.04 = 2.62 \text{ ml}\) (where 54.50 is the flow at \(V_1\) and 76.30 is the flow at \(V_2\)). Therefore the volume inspired from \(V_0\) to
\[ V_2 = 1.09 + 2.62 = 3.71 \text{ ml} \]

Calculations were thus continued until the volumes inspired at \( V_1, V_2, V_3 \) etc., were determined. The corresponding pressure changes were obtained from the pressure tracing.

Similarly, the pressure volume relations were determined also during expiration.

**Measurement of nonelastic resistance**

Eg. Nonelastic resistance at a point corresponding to \( V_3 \) is:

\[ V_3 = \text{Nonelastic pressure at } V_3 \]

\[ \text{Airflow at } V_3 \]

Volume change from \( V_0 \) to \( V_3 = 36.50 \text{ ml} \)

Pressure change from \( P_0 \) to \( P_3 = 1.0 \text{ cm H}_2\text{O} \)

Dynamic compliance (calculated as shown in Fig. 20) = 38.88 ml/cm H\(_2\)O

Elastic pressure = \( \frac{36.5}{38.88} = 0.96 \text{ cm H}_2\text{O} \).

Therefore, nonelastic pressure = 1.0 cm - 0.96 cm = 0.04 cm H\(_2\)O

Airflow at \( V_3 = 76.3 \text{ ml/sec} = 0.0763 \text{ L/sec} \)

Therefore, nonelastic resistance = \( \frac{0.04}{0.0763} \)

= 0.52 cm H\(_2\)O/Lps

Similarly, expiratory nonelastic resistance was measured from expiratory airflow and pressure changes.