



## Intrapulmonary Effects of Setting Parameters in Portable Intrapulmonary Percussive Ventilation Devices.

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**BACKGROUND:** Despite potential benefits of intrapulmonary percussive ventilation (IPV) in various respiratory diseases, the impact of setting parameters on the mechanical effects produced by IPV into the lungs is unknown. We hypothesized that changing the parameters on IPV modulate these effects. This in vitro study aimed at comparing the changes in intrapulmonary effects resulting from changes in parameters in three portable IPV devices (IMP2®, Impulsator® and Pegaso®).

**METHODS:** Parameters were set in 72 combinations of frequency (90 to 250 cycles/min), inspiratory on expiratory time ratio (I/E time ratio from 1/2 to 3/1) and pressure (10 to 60 CmH<sub>2</sub>O). Four resulting effects were recorded on a test lung via a pneumotachometer: the expiratory on inspiratory flow ratio (E/I flow ratio), the positive end-expiratory pressure (PEEP), the ventilation and the percussion. Percussion was assessed by the end-slope of pressure curve. Analysis of variance (ANOVA) was used for data analysis.

**RESULTS:** E/I flow ratio increased with increasing I/E time ( $p < 0.001$ ). The Pegaso® produced the lowest E/I flow ratio. PEEP raised 6 CmH<sub>2</sub>O in both IMP2® and Impulsator® and 17 CmH<sub>2</sub>O in the Pegaso® with increasing frequency ( $p < 0.01$ ), pressure and I/E time ratio ( $p < 0.001$ ). In all devices, ventilation increased with increasing pressure and decreasing frequency ( $p < 0.001$ ). Percussion increased with increasing frequency and decreasing I/E time ratio ( $p < 0.001$ ), and with increasing pressure when I/E time ratio was 1/1 or less. The Pegaso® provided the poorest percussion.

**CONCLUSIONS:** This study suggests that changing the parameters considerably modulate the mechanical effects produced by portable IPV devices into the lungs. Increasing frequency increased PEEP and percussion but decreased ventilation. Increasing I/E time increased PEEP and E/I flow ratio, and decreased percussion. Finally, increasing pressure increased PEEP and ventilation. The Pegaso® produced the highest PEEP, least percussion, and smallest change in E/I flow ratio.

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