

## **EFFECT OF BODY POSITION ON ACTIVATION OF HUMAN RESPIRATORY MUSCLES DURING MAXIMAL INSPIRATORY MANOEUVRE**

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A study was undertaken to evaluate the maximal mouth inspiratory pressure and to describe the pattern of recruitment of respiratory and accessory muscles used in the generation of this voluntary manoeuvre during different body positions. 9 normal human (6 men and 3 women) participated in this study. The mean age was  $22.0 \pm 0.6$  yr. Maximal inspiratory mouth pressures (MIP) during Muller manoeuvre were measured from residual volume in the standing, sitting, right side lying (RSL), left side lying (LSL), supine and head-down-tilt (HDT) ( $-30^\circ$  relatively horizon). The level of electrical activity of the diaphragm (D), intercostal parasternals (PS), sternomastoids (SM) and genioglossus (GG) was studied during Muller manoeuvre in each of body postures. MIP in the standing position was  $105.3 \pm 6.9$  in men and  $59.9 \pm 6.9$  cm H<sub>2</sub>O in women (control). Both in men and women MIP did not significantly differ from control values in the sitting, supine, RSL and LSL. But MIP in HDT were lower by 23% and 27% compared with control in men and women respectively ( $P < 0.05$ ). During Muller manoeuvres, the diaphragm and inspiratory accessory muscles act as synergists to generate a subatmospheric pressure in the thoracic cavity. Integrated electromyographic activity (EMG) recorded from diaphragm during Muller manoeuvre was near the control in sitting, supine, RSL, LSL and significantly greater in HDT compared with standing. On the contrary, the PS showed the highest level of activation during Muller manoeuvre in standing position, but in all other postures its activation was significantly lower. Activation of sternomastoids during MIP was near the control in the sitting and lower-than-control in supine (81%), RSL (85%), LSL (80%) and especially in HDT (72%) ( $P < 0.05$ ). Quantitative measures of integrated EMG showed that activation of GG was significantly greater during maximal inspiratory effort in supine position and HDT (125% and 130% respectively) while its activation was lower in sitting, LRS and LLS (76%, 57% and 43%) compared with standing ( $P < 0.05$ ). We conclude that MIP in normal human is similar in the standing, sitting, right side lying (LRS), left side lying (LLS) and supine positions, but lower in HDT ( $P < 0.05$ ). The pattern of respiratory muscle activity suggests the existence of a possible hierarchy of muscle recruitment – different muscle groups recruit in a particular order, when human performs maximal innspiratory manoeuvre in different body positions. The diaphragm is maximally active during voluntary inspiratory effort in all body positions, especially in HDT. PS and SM accessory muscles, acting in synergism with D are not necessarily activated to the same extent. Activation of GG is maximally in supine and HDT postures.