Mechanisms of genioglossus responses to inspiratory resistive load in rabbits.

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The purpose of the present study has been to determine whether pharyngeal dilator muscles participate in inspiratory load compensatory responses and if so, to elucidate role of upper airway mechanoreceptors in these responses. The experiments were performed on anaesthetized rabbits. Each animal was tested in three ways by the imposition of inspiratory resistive load: (1) at upper airways via face mask, (2) at the tracheostomic cannula placed below larynx (all upper airway receptors were 'bypassed') and (3) at the mouth after the section of the hypoglossus nerves (motor denervation of genioglossus muscle). The inspiratory load applied to the upper airways evoked significant increases in integrated genioglossus activity (to 129 +/- 14.7% of control) and its inspiratory duration (to 113 +/- 5% of control) already within the first loaded breath (P < 0.05). The increases in the inspiratory activity of musculius genioglossus were relatively greater than the simultaneous increases in the activity of the diaphragm. Motor denervation of the pharynx dilator muscles (including m. genioglossus) increased airway resistance to 184 +/- 19% of control (P < 0.05) and induced obstructive alterations in the breathing pattern during unloaded breathing: decrease in maximal inspiratory flow (-13%) and increase in the level of negative oesophageal pressure (+14%) and the peak diaphragm activity (+6%). After nervi hypoglossus sections additional increases in motor and pressure outputs were required in order to maintain unaltered ventilation at the same degree of loading as before denervation. The results indicate that the pharyngeal dilator muscles have a role in compensation of added inspiratory load. Activation of these muscles facilitate the load compensating function of 'pump' muscles by decreasing airway resistance. Tracheostomy did not reduce the genioglossus response to inspiratory loading, ruling out any role for upper airways receptors in the genioglossus response to inspiratory load compensations.

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