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Changes in orofacial muscle activity in response to changes in respiratory resistance.

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Increased resistance in the upper airway is known to be a contributing factor to deviant facial growth patterns. These patterns are the result of a prolonged presence of unbalanced oropharyngeal muscle activity. We hypothesized that mechanically increasing airway resistance would enhance the activity of the muscles facilitating respiration, and we attempted to demonstrate that the increased muscle activity is modulated by mechanoreceptors in the pharyngeal airway. The response of oropharyngeal muscles to increased airway resistance during spontaneous breathing was observed in 11 rabbits. Electromyographic signals from the ala nasi, orbicularis oris superior, genioglossus, mylohyoid muscles, and the diaphragm were recorded by fine-wire electrodes. Pressure changes were monitored by pressure transducers at the side branch of the cannule close to openings for the nose and the trachea. The study consisted of 2 experimental sessions. First, to evoke the response of muscles to the inspiratory resistance, increasing stepwise polyethylene tubes of various diameters were attached to the nasal and tracheal opening and the diameter of the tubes was gradually reduced. Muscle activity changes in response to the increased resistance were recorded during spontaneous nasal or tracheal breathing. Second, to examine muscle responses to negative pressure to the pharyngeal airway, irrespective of breathing activity, the pharynx was isolated as a closed circuit by a stoma constructed at a more caudal side in the trachea. Muscle responses to the negative pressure generated by a syringe in the pharyngeal segment were measured. Nasal breathing induced a greater muscle activity than did tracheal breathing, in general, at $P < .05$. When resistance was gradually increased, nasal breathing resulted in a greater increase in muscle activity than did tracheal breathing ($P < .05$), except in the diaphragm. Application of negative pressure to the isolated pharyngeal airway segment increased the muscle activity significantly ($P < .05$). We conclude that an increased airway resistance may facilitate oropharyngeal muscle activity through mechanoreceptors in the oropharyngeal airway.