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RESPONSES OF HYPOGLOSSAL MOTONEURONS TO MECHANICAL STIMULATION OF THE TEETH IN RATS

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INTRODUCTION

The motoneurons of the hypoglossal (XIIth) nuclei provide the only source of somatic innervation of the intrinsic and extrinsic tongue muscles. Physiological studies have shown that exteroceptive and proprioceptive intraoral afferents modulate the activity of the hypoglossal neurons to control the tongue movements. Hypoglossal reflexes can be elicited by electrical stimulation of the lingual nerve (4, 27, 31, 32, 37) and by mechanical, chemical and thermal stimulation of the tongue surface (13, 39). Mechanical stimuli applied to the gingival mucosa are also able to modify the linguo-hypoglossal reflex (41). Other workers recorded synaptic potentials in the hypoglossal motoneurons following stimulation of the inferior alveolar and masseteric nerves (26, 27, 36). The alveolar nerves also contain low threshold large fibers connected with the mechanoreceptors involved in the tactile and pressure sensation of the teeth (34, 35).

The tooth mechanoreceptors located in the periodontal ligament respond to a pressure stimulus applied to the crown of the tooth (1, 10, 18, 28). Their function is, therefore, to signal the position of the bolus within the mouth and detect the load on the teeth during tooth contact in the course of mastication. Experimental studies have shown that during chewing movements the periodontal ligament receptors exert a feedback control over the trigeminal motoneurons, thus playing an important role in modulating the activity of the jaw muscles in the different phases of the mastication cycle (2, 8). It is not yet clear whether the afferent activity of tooth periodontal receptors, when naturally stimulated, contributes to control the displacement of the tongue in the mouth. In the present study, electrophysiological experiments were performed to investigate whether mechanical stimulation of the teeth could modulate the spontaneous electrical activity of single hypoglossal motoneurons. In addition, recordings of the unitary discharge were made from hypoglossal nerve and genioglossal muscle fibers.

METHODS

Thirty-five Wistar rats, weighing between 250 and 350 g were used for this investigation. The animals were anesthetized with ketamine (60 mg/kg i.p.) and maintained with additional