DESIGN AND IMPLEMENTATION OF A METHOD TO STUDY LARYNGEAL RESISTANCE DURING THE STIMULATION OF CUNEIFORM NUCLEUS (CnF) IN SPONTANEOUSLY BREATHING ANAESTHETIZED RATS

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ABSTRACT

Background: abduction and adduction of the vocal folds are performed by two populations of motoneurons located in the caudal portion of the nucleus Ambiguus (nA). In the rat, the loose formation of the nA contains motoneurons innervating the laryngeal muscles. In previous studies we have demonstrated a functional interaction between hypothalamic (DMH-PeF), mesencephalic (dlPAG) and pontine nuclei (PBc, A5 region) involved in cardiorespiratory control and in changes of laryngeal caliber (López-González et al., 2020; Lara et al., 2002). The Cuneifom nucleus (CnF) of the mesencephalon has afferent and efferent connections with all these nuclei. The aim of this study was to characterize the electrophysiological relationships between the CnF and those pontine-medullary neuronal circuits to understand their role in laryngeal control and its effect on vocalization

Objectives: to characterize the role of the CnF in the central mechanisms controlling laryngeal motoneuron activity and its role in vocalization. To achieve this objective is necessary to develop a variation of the classical technique of the "isolated glottis in situ" for the recording of subglottic pressure in rats.

Methods: Experimental basic preclinical study in non-inbred male rats. SPF, Sprague-Dawley (250-300 grams) housed under standard conditions have been used. Animals were anesthetized with sodium pentobarbitone (60 mg/kg i.p., initial dose, supplemented 2 mg/ kg, i.v., as necessary). A double tracheal (upwards in direction of the glottis for the "glottis isolated in situ" technique, and downwards in the direction of the carina) and esophageal cannulation were performed. Vagus and laryngeal recurrent nerves were isolated and stimulated with bipolar electrodes (Ag/AgCl). Bilateral parietostomy allowed access to the CnF and nA. Electrical stimulation of the CnF using concentric bipolar electrodes was performed (1 ms pulses, 20-40 μA, 100 Hz for 5 s). Subglottic pressure, respiratory flow, pleural pressure, blood pressure, heart rate and unitary neuronal activity were also recorded.

Results: Subglottic pressure was recorded in rats with an aneroid transducer (ADInstrument model FE141, ± 0,03 psi) by passing a stream of humidified medical air upwards through the larynx at a constant rate of 50-100 ml/min with a thermal mass digital air flow meter controller (Bronkhorst Hi-Tec F-201CV-AGD-22-V)

Conclusions: Our variation of the classical technique for the recording of the "isolated glottis in situ" in rats shows good dynamic responses and can be perfectly used as an index of subglottic pressure and laryngeal activity.

Keywords

Subglottic Pressure, Laryngeal Motoneurons, Cuneiform nucleus, Rat.

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