Keywords: Inspiratory phase; Phrenic signal; Phrenic waves; Expiratory-facilitator; Stimulus e cacy; Computer summation

Introduction

e e ects of stimulation at an inspiratory-facilitator point in the dorsolateral pons were, shortening of the expiratory phase during which the stimulus train was started, increased phrenic discharge in subsequent inspiratory phases, as shown by the increased slope and peak amplitude of the integrated phrenic signal and shortened expiratory phases throughout the period of stimulation. e sequence of e ects was typical of the many electrode explorations made in the rostral lateral pons. With high-frequency stimulation and stimulus pulse durations of 0.1-0 3 m-sec, the threshold currents for switching of the respiratory phases were in the range 0 1-0 3 mA [1]. Prominent inspiratory-facilitator e ects were obtained dorsally in the region of the nucleus Para brachialis, more ventrally, there was a zone of transition; and still more ventrally, prominent expiratory-facilitator e ects were obtained from the region medial to the nucleus of the lateral lemniscuses [2]. In more medial electrode tracks at the same level of the pons, similar sequences of e ects were obtained, but the e ects were always of lesser magnitude than those obtained from the more lateral regions. A detailed analysis of the changes in phrenic discharge produced by stimulation during the inspiratory phase reveals the

Citation: Antonello N (2023) Respiratory Responses Evoked by Switching Phases. J Respir Med 5: 173.

points were stimulated, the increase of phrenic discharge was usually associated with shortening of the inspiratory phase, although the degree of shortening was less than that for inspiratory-inhibitory points.

Discussion

Less commonly, the initial increase of phrenic discharge was maintained at a constant level for times up to several hundred m-sec, so that the duration of the inspiratory phase was lengthened as shown in (Figure 2). The latter effect usually occurred in cats where the spontaneous inspiratory burst had an apneustic tendency, i.e. where there was maintained phrenic discharge following the initial period of augmenting discharge. The general experimental procedure used in this study was to locate points in the lateral pons where stimulation produced marked inspiratory-facilitator or expiratory-facilitator effects, and then to study the dependence of these phenomena on different parameters and patterns of stimulation [10]. Special attention was paid to the dependence of responses on time of stimulation in the respiratory cycle. When short stimulus trains of suitable properties were applied to inspiratory-facilitator points during the expiratory phase, the result was switching from the expiratory to the inspiratory phase, i.e. the onset of a complete inspiratory phase [11]. A striking feature of the switching response was its relatively sharp threshold as a function of stimulus conditions, stimulation produced either, a moderate shortening of the expiratory phase or a small phrenic burst, or with increased stimulus efficacy, a complete inspiratory burst similar to the normally occurring burst. Another interesting effect is that, at a particular current strength near threshold, some individual trains produced switching to the next phase while others produced only a moderate shortening of the phase. This effect is shown more systematically in a series from another cat, where test trains were delivered at each of several current strengths, and starting at the same delay from the start of the expiratory phase. At lower current strengths, each train had little or no effect; at intermediate strengths, some individual trains had little effect while others produced switching to the inspiratory phase, finally, at each of the highest current strengths, all trains produced switching to the inspiratory phase [12]. Once the threshold for switching from the expiratory to the inspiratory phase had been reached, further increase of stimulus efficacy resulted in decrease of the latency from start of the stimulus train to start of the inspiratory phase. This latency decrease also occurred as a stimulus train with particular parameters was delivered later in the expiratory phase. The graph shows the effects of stimulus trains of given parameters delivered at different times during the expiratory phase. The trains delivered in the first half of the expiratory phase caused moderate shortening of the phase, which was about the same for each time of stimulus delivery; while those starting 2*2 see or more after the start of the phase caused drastic shortening of the phase and switching to the inspiratory phase [13]. The sharpness of threshold for the production of the switching response is indicated by the discontinuity in the curve. Beyond this 2-2 see delay, as the trains were delivered later, the median latency from train onset to onset of the inspiratory phase decreased progressively. Additional features of this decrease of latency with later stimulus delivery can be seen in the traces of summed phrenic potentials [14].

The stimulus-evoked inspiratory phase can start even after the stimulus train has ended, indicating that an effective switching process had been set into motion by the earlier stimuli of the train. Further, with later stimulus delivery, the dispersion of the onset of individual inspiratory phases is reduced, as indicated by, the sharp peak at the onset of the summed phrenic burst activity and the small range of the times of

11. Cohen SP, Mao J (2014) Neuropathic pain: mechanisms and their clinical implications. BMJ UK 348:1-6.

12. Mello RD, Dickenson AH (2008) Spinal cord mechanisms of pain. BJA US 101:8-16.

13. Bliddal H, Rosetzsky A, Schlichting P, Weidner MS, Andersen LA, et al. (2000) A randomized, placebo-controlled, cross-over study of ginger extracts and ibuprofen in osteoarthritis. Osteoarthr Cartil EU 8:9-12.

14. Maroon JC, Bost JW, Borden MK, Lorenz KM, Ross NA, et al. (2006) Natural anti-inþammatory agents for pain relief in athletes. Neurosurg Focus US 21:1-13.