GANGLION CELLS IN THE LATERAL CRICOARYTENOID MUSCLE OF THE NORMAL ADULT RAT. A LIGHT MICROSCOPIC STUDY

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ABSTRACT

The innervation of the lateral cricoarytenoid muscle was examined using light microscopy. Some ganglion cells are considered to enter the muscle, accompanied by branched nerves. These findings suggest that, in the rat lateral cricoarytenoid muscle, intramuscular ganglion cells exist and may be involved in innervating and contracting smooth muscle cells of the arterioles, thus regulating the blood flow or intravascular pressure.

Key words: Ganglion cells, Laryngeal muscles, Lateral cricoarytenoid, Rat.

The intrinsic laryngeal muscles, a group of specialized skeletal muscles, are associated with the regulation of the complex function of the larynx. Many light and electron microscopic studies have been performed on muscle fibers (Malmgren and Gacek, 1981) and normal, denervated, and reinnervated neuromuscular junctions (Abo, 1975; Morales et al., 1980; Yoshihara et al., 1984, 1991; Nomoto et al., 1993; Kawakita et al., 1998) of these muscles in various animals and the human.

On the other hand, it is of particular interest to note that, in addition to the motor innervation, ganglion cells exist in the intrinsic laryngeal muscle of the dog (Hisa et al., 1996) and rat (Neuhuber et al., 1994). During the course of light microscopical studies by toluidine blue-stained semithin sections of the rat cricothyroid and posterior cricoarytenoid muscles, ganglion cells were seen in and around the posterior cricoarytenoid muscle, while no ganglion cells seemed to exist in the cricothyroid muscle (Desaki et al., 2003). However, it is still uncertain whether or not intramuscular ganglion cells exist in all intrinsic laryngeal muscles.

Therefore, the present study employed light microscopy for a detailed examination of the presence and functional significance of ganglion cells in the lateral cricoarytenoid muscle of the normal adult rat.

Two 3-month-old albino (Wistar) rats, weighing 180-200g, were used in this study. The animals were housed at a constant temperature with a 12: 12 light-dark cycle, and given food and water ad libitum.

After the animals were anesthetized using Halothane, the entire larynx was excised. The lateral cricoarytenoid muscle was dissected, and fixed with a fixative containing 3% glutaraldehyde. Then, it was washed in buffer and postfixed in 1% osmium tetroxide, followed by a buffer wash. The specimens were dehydrated through a graded series of ethanol (50% to 100%) and cleared by propylene oxide. Infiltration was done using propylene oxide and epoxy resin. The specimens were embedded with epoxy resin. Embedded mould was kept in the incubator at 60 degrees for 48 hours. Serial semithin sections (1µm thick) were cut with an ultramicrotome (Leica ultracut UCT) and stained with toluidine blue.

The present study revealed that, in the rat lateral cricoarytenoid muscle, a myelinated nerve enters the muscle, branches and individual nerve fibers form neuromuscular contacts with individual muscle fibers, Nonmyelinated nerve fibers often formed synapses with each other and with the cell body of ganglion cells. The intramuscular ganglion cells observed in the lateral cricoarytenoid muscle,
are solitary and in groups, distributed among muscle fibers and near arterioles (Fig. 1). Our findings suggest that, intramuscular ganglion cells and their associated nerve fibers may be involved in innervating the smooth muscle cells of arterioles, thus regulating the blood flow or intravascular pressure.

REFERENCES


FIG. 1. Ganglion cells (arrowheads) in and around the lateral cricoarytenoid muscle. A myelinated nerve bundle (arrow) can be seen. (Toluidine blue-400)