4. Research Categories: Germinating Research.
5. Research Theme: Physiology and morphology of the otolith-activated vestibular neurons.
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8. Summary of Research: [Theme-1] Eye movements evoked by the selective stimulation of the utricular nerve in cats. Goto et al. Auris Nasus Larynx (2003). Eye movements evoked by otolith organ are not well investigated. In the decerebrate cats, we found ipsilaterally directed horizontal eye movements in both eyes after stimulation of the utricular (UT) nerve. These results confirm the known monosynaptic connections from UT afferents to the ipsilateral abducens nucleus neurons (Uchino et al. 1994). Eye movements evoked by the selective stimulation of the saccular nerve in cats. Goto et al. Auris Nasus Larynx (in press). In the absence of anesthesia in decerebrate cats, we found upward eye movements in both eyes after stimulation of the saccular nerve (SAC) nerve. These results confirm the known neuronal connectivity from SAC afferents to the extraocular motoneurons (Isu et al. 1994). [Theme-2] Morphology of physiologically identified otolith-related vestibular neurons in cats. Meng et al. Neuroscience letters (2002). Otolith nerve-activated vestibular neurons were investigated using intracellular injections of HRP. The labeled otolith-related neurons were large and middle size of the pyramidal, elongated and ovoid in shape. [Theme-3] Convergence of ipsilateral semicircular canal inputs onto single vestibular nucleus neurons in cats. Sato et al. Exp Brain Res (2002). Convergent inputs from the ipsilateral SAC nerves onto single vestibular neurons were investigated. We showed that approximately one-fifth of vestibular neurons received convergent inputs from either the anterior/posterior and horizontal/posterior canal nerve pairs. In each nerve pair, approximately 50% of convergent neurons projected to the spinal cord. [Theme-4] Convergence of the anterior semicircular canal and otolith afferents on cat single vestibular neurons. Zhang et al. Exp Brain Res (2002). The convergence between the anterior canal (AC) and UT inputs, as well as the convergence between AC and SAC inputs in single vestibular neurons were investigated. Forty percent neurons received convergent inputs after stimulation of the AC/UT nerves. Majority of convergent neurons sent axons to the upper cervical spinal cord through the medial vestibulospinal tract. Similar results were observed between AC and SAC inputs in single vestibular neurons. [Theme-5] Neural activity of the lateral vestibular nucleus neurons after stimulation of the vestibular nerve in rat. Stimulation of the vestibular nerve evoked N1 field potentials in the lateral, descending and medial vestibular nuclei; little field potential activity was seen in the superior nucleus. The distribution of field potentials overlapped with that of neurons of origin of the vestibulospinal tracts. [Theme-6] Properties of utricular-activated vestibular neurons that project to the contralateral vestibular nuclei in the cat. Bai et al. Exp Brain Res (2002). The properties of UT-activated vestibular neurons that send axons to the contralateral vestibular nuclei (commissural neurons) were investigated. Majority of the commissural neurons received monosynaptic inputs from the UT nerve. Twelve, 5, and 10 out of 27 commissural neurons were located in the medial, lateral and descending vestibular nuclei, respectively. Majority of the commissural neurons also send axons to the upper cervical spinal cord through the medial vestibulospinal tract. [Theme-7] Properties of
Axonal pathways, projection levels, and locations of horizontal semicircular canal (HC) activated vestibular neurons were studied. Most HC nerve activated vestibular neurons were activated antidromically only from C1/C2 segments. No neurons were antidromically activated from the L3 segment. It is likely that the majority of HC-activated vestibular neurons may terminate in the upper cervical neck motoneurons.

Properties of anterior semicircular canal nerve-activated vestibulospinal neurons in cats. Kitajima et al. Exp Brain Res (in preparation). Axonal pathways, projection levels, and locations of AC nerve activated vestibular neurons were studied. Most AC nerve activated vestibular neurons were activated antidromically only from C1/C2 segments. Only one neuron was antidromically activated from the L3 segment. It is likely that the majority of AC nerve activated vestibular neurons terminate in the upper cervical neck motoneurons.

9. Publication List

10. URL: nothing