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**Biochemical pathway between cervical spinal and sympathetic ganglia in rabbits:
Neural basis between neck pain and vertigo**

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Background: Neck pain and vertigo commonly concur in patients with cervical vertigo. But the mechanism of two symptoms concurring still remains unclear. We found that bidirectional segmental nerve fiber connections existed between cervical spinal and sympathetic ganglia using Fluorogold retrograde tracing in rabbits. We think that the connections between two ganglia may play an important part in two symptoms concurring. The biochemical mechanism of these neural connections is now unclear, so we make this study.

Purpose: This study aimed to investigate the biochemical pathway between cervical spinal and sympathetic ganglia.

Study design/Setting: Noradrenaline (NE) in cervical sympathetic ganglia or neuropeptide Y (NPY) in cervical spinal ganglia was evaluated using immunohistochemical staining after electrical stimulation of cervical spinal ganglia or cervical sympathetic ganglia in rabbits.

Methods: Experimental rabbits were randomly divided into NE groups (n=70), NPY groups (n=20) and one control group (n=10). In NE experimental groups, left C2-C8 spinal ganglia were respectively stimulated for 5 minutes. The left superior and inferior cervical sympathetic ganglia were cut after experimental animals were perfused with physiological saline and 4% paraformaldehyde. In NPY experimental groups, left superior and inferior cervical sympathetic ganglia were respectively stimulated for 5 minutes. The left C2-C8 spinal ganglia were cut after experimental animals were perfused. The NE in sympathetic ganglia and NPY in cervical spinal ganglia were expressed using immunohistochemical staining. The mean optical density (MOD) of cryosections was assayed by image analysis system. The data in experimental groups and control group were compared by one-way ANOVA.

Results: When C2-C5 or C5-C8 spinal ganglia were stimulated for 5 minutes, the noradrenaline MOD in ipsilateral superior or inferior cervical sympathetic ganglia increased significantly ($P<0.05$), respectively. And the noradrenaline MOD in ipsilateral superior cervical sympathetic ganglia in group C2 was significantly higher than the values in other groups ($P<0.05$). When superior or inferior cervical sympathetic ganglia were stimulated for 5 minutes, the neuropeptide Y MOD in ipsilateral C3-C4 or C6-C7 cervical spinal ganglia increased significantly ($P<0.05$).

Conclusions: NE and NPY participating in the neural connections between cervical spinal and sympathetic ganglia was observed. NE and NPY may be important neurotransmitters of studying neck pain and vertigo.

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