Diencephalon Plays an Active Role in Respiratory Drive

Isato Fukushi* · Yosuke Kono · Shigefumi Yokota · Kotaro Takeda
Shuntaro Okazaki · Itaru Yazawa · Hiroshi Onimaru
Yasumasa Okada

* Clinical Research Center, Murayama Medical Center

Key words / Diencephalon, Diencephalon-lower brainstem-spinal cord preparation, Respiratory drive

[ABSTRACT]

[Background/Purpose]
The diencephalon is one of the brain regions where stroke occurs frequently. Because patients with stroke often present respiratory disorders and it has been suggested that the diencephalon plays a role in modulation of respiration, it would be necessary to elucidate how the diencephalon modulate respiration. Here, we aimed to address this issue.

[Methods]
We examined respiratory frequency in the isolated diencephalon-lower brainstem-spinal cord preparations of newborn rats (n=11, P0-P1), before and after transection of the diencephalon. Briefly, the diencephalon, lower brainstem and spinal cord were together isolated from neonatal rats under isoflurane anesthesia. The preparation was fixed in a recording chamber and continuously superfused with oxygenated (95% O2, 5% CO2) artificial cerebrospinal fluid at 26°C~28°C. Neural respiratory output was recorded from ventral roots of the 4th cervical spinal cord (C4). The respiratory frequency was obtained as the frequency of the C4 burst activity.

[Results]
Ablation of the diencephalon decreased respiratory frequency. The paired t-test was carried out to examine significant differences of the respiratory frequency. Respiratory frequency was decreased after ablation with statistical significance (p = 0.007).

[Discussion/Conclusion]
We conclude that the diencephalon plays an active role in facilitation of respiration. Further studies are needed to identify the diencephalic region that augments respiratory output.

[Ethical consideration]
This study was conducted with the approval of the Animal Experiment Ethics Committee of Murayama Medical Center.