Effects of intrathecal injection of bupivacaine on GABAAR α 1 in rats

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Background and Goal of Study

Accumulating evidence suggested that spinal anesthesia had sedative effect, but its mechanism was still not clear. We previously found that bupivacaine spinal anesthesia could increase the contents of inhibitory amino acid GABA. Our hypothesis was that subarachnoid block would be related to the expression of GABAAR α 1 subunit in the lumbar spinal cord of rats.

Materials and Methods

With IRB approval, 32 male Sprague-Dawley rats were randomly divided into four groups (n=8) as follows:

Control group (group C)

Saline group (group NS)

0.5% bupivacaine 10 minutes group (group B10)

0.5% bupivacaine 30 minutes group (group B30)

The rats were intrathecally catheterized and rats were intrathecally administrated 20 microliter of saline in group NS and 20 microliter of 0.5% bupivacaine in group B10/B30, respectively. The rats were sacrificed and took out the lumbar spinal cord and the protein level of GABAAR α 1 subunit in cytoplasm, membrane and whole-cell were detected by western blot. Densitometric analysis was performed on the western blot images using Image J to quantitate the amount of protein levels. The level of protein was analyzed by one-way ANOVA and $P < 0.05$ was taken as statistically significant.

Results and Discussion

The whole-cell protein content of GABAAR α 1 subunit had no difference among groups ($P > 0.05$), while the content in the cytoplasm and membrane were significantly changed. In the cytoplasm, the protein content of GABAAR α 1 in group B10/B30 were significantly decreased compared with group C and group NS ($P < 0.05$ or $P < 0.01$). The membrane protein content of GABAAR α 1 were significantly increased in group B10/B30 than that in group C and group NS ($P < 0.05$ or $P < 0.01$). Our results indicate that intrathecal injection of bupivacaine is related to the cytoplasm GABAAR α 1 subunit protein transport to the cell membrane, which may mediate in part the sedation of spinal anesthesia.

Conclusion

Intrathecal bupivacaine has no effect on the whole-cell GABAAR α 1 subunit protein in the intumescentia lumbalis of rats. However, it is related to the cytoplasm GABAAR α 1 subunit protein transport to the cell membrane, and maybe it is one of the mechanisms of spinal anesthesia-induced sedation.

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