Exploring the brain and spinal cord by a fine flexible fiberscope

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Since we demonstrated the feasibility of inserting a fine flexible fiberscope through the lumbar spinal tap method to the human cisterna magna and cerebral ventricles in 1988 [1], 1991 [2] and 2009 [3,4], there have been no further developments in this new method, seemingly due to the difficulty in manipulating techniques and manufacturing so fine flexible fiberscopes, except the similar work by Layer et al. [5]. They, however, used the guide wire for insertion of the fiberscopes, which could cause the damage to the spinal cord or brain. The fibers should be floating and flexible throughout in the subarachnoid space.

Our study demonstrated that the brainstem structures can be safely and easily visualized with this method. The safety of this technique could be assured by the following 5 precautions.

First, the fiberscopes were introduced through a subarachnoid puncture at the lumbosacral level (L5/S or L4/L5 level), which eliminates the possibility of injuring the spinal cord. Second, the fiberscopes are fine and flexible enough to float easily in the cerebrospinal fluid (CSF). Even when the fiberscope hit the roots or vessels in the CSF, it slips out of those structures without causing any discomfort or dysesthesia during the procedures. Fourth, the operator communicated with the patients frequently throughout the procedures, and monitored the patient’s general condition. Fifth, constant visualization through the fiberscope image and x-ray image showed the position of the fiberscope tip during the procedures.

The safety of the present techniques was further supported by the absence of any major complications afterwards except headache occurred in the first 4 cases. The study showed that these headaches were caused by the dural puncture and prevented by the epidural saline injection and bed rest after the test [6].

Transaqueductal navigation of the 4th ventricles were also safely and successfully carried out by Longatti et al. [7] with ‘small flexible endoscopes’, which was however carried out through a frontal burr hole.

In addition to safety, this technique is simple to carry out and needs no surgical procedures. The method is so simple and safe that it could be carried out at the bedside once the operator becomes familiar with the techniques.

At the same time, advancement in technology to manufacture such fine, flexible and operable fiberscopes is longed for exploring visually the brain diseases and treating these.

References
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