

## Title

### Selection of Spinal Needles for Cerebrospinal Fluid Collection in Clinical Trials

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## The Methodological Question Being Addressed

What type of spinal needle should we select for cerebrospinal fluid collection in clinical trials?

## Abstract

### Introduction

The cerebrospinal fluid (CSF) collection became a standard procedure in CNS drug development. Being the post-dural puncture headache (PDPH) the most common complication following the procedure, various measures have been taken to ensure both the subject's safety and the quality of the samples. The types of used needles are considered one of the factors to develop PDPH and larger gauge with or without non-cutting tips are often used to prevent PDPH even though it usually requires more time to collect CSF than using smaller gauge needles. Given the fact that obtaining the necessary amount of CSF within a certain period is also crucial in clinical trials, the optimal selection of needles can be a key factor for a successful CSF sampling in clinical trial settings. In this study, we retrospectively investigated the relationship between the flow rate of CSF and the adverse events related to lumbar puncture by needle type.

### Methods

The data of 67 volunteers (ages 21-82; mean  $\pm$  SD,  $76 \pm 12$ ; male, 64%) who underwent CSF collection by lumbar puncture from September 2016 to November 2018 at SOUSEIKAI Fukuoka Mirai Hospital were analyzed. All the CSF collections were performed by four in-house anesthesiologists. We divided the data into 4 groups: Group A, 21G Quincke (n=26); B, 22G Quincke (n=6); C, 22G pencil-point (n=19); D, 24G pencil-point (n=16), and investigated the flow rate and the adverse events associated with the type of needles used.

All the procedures were carried out as a part of clinical trials and the protocols were reviewed and approved by SOUSEIKAI Hakata Clinic IRB.

### Results

The time from local anesthesia to initial CSF outflow did not show differences among the groups. The flow rates of CSF were lower in the thinner needle groups ( $2.0 \pm 0.5$  mL/min in 21G,  $1.3 \pm 0.4$  mL/min in 22G, and  $0.4 \pm 0.1$  mL/min in 24G needle,  $p < 0.001$ ). The types of the tip of needle used within the same 22G group (Quincke or pencil-point needle) did not affect the flow rate of CSF ( $1.3 \pm 0.4$  mL/min,  $1.3 \pm 0.4$  mL/min, respectively). Two volunteers (6%) had headaches, and two (6%) had the heaviness of head in the Quincke needle group (Group A and B), but no volunteer (0%) had headaches or heaviness of head in the pencil-point needle group (Group C and D).

### Conclusions

In this study, the incidence of PDPH was significantly reduced, whereas the flow rate of CSF was lower when atraumatic thinner needles were used. In order to prevent PDPH while obtaining the required amount of CSF, the needle gauge and the

shape of the tips should be carefully selected for each study in consideration of the necessary amount of CSF, the allowance time for lateral position following the procedure, and the incident rate of adverse events correlated with the needle type.