



Applicability of Automated Brain Volumetry in South Korean Population: Need for Population-Based Database

자동 뇌 정량화 결과의 임상 적용: 한국인 기반의 빅데이터 구축의 중요성

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See the article, “Comparison of Normative Percentiles of Brain Volume Obtained from NeuroQuant® vs. DeepBrain® in the Korean Population: Correlation with Cranial Shape”, in volume 84 on page 1080-1090 (<https://doi.org/10.3348/jksr.2023.0006>).

The role and use of automated brain volumetry are ever-increasing in many clinical settings, not only for diagnosing neurodegenerative diseases in the context of cognitive impairment, but also for health screening purposes (1-3). The most widely used software packages in clinical practice in South Korea are NeuroQuant (NQ) and Deepbrain (DB). Such software provides automated intracranial volume and volumes of anatomical structures, as well as normalized volumes as a percentage of the intracranial volume. Additionally, the normative percentiles of intracranial volume and volume of anatomical structures are provided based on the database of the reference population. This may enable the estimation of brain volumetry in the context of a larger population so that volumetric measurements may be interpreted with reference to healthy controls. Commercially available software currently offers normative percentiles adjusted for age and sex, but lacks consideration for ethnic variations. While the race and ethnicity of the normative databases are not disclosed for NQ, the database was constructed for the South Korean population. Therefore, there is a difference in the reference population of the normative database in different commercially available software.

In this issue of JKSR, Yang et al. (4) explored the differences in the normative percentiles of

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brain structures between NQ and DB, and showed that cranial shape may contribute to such differences. The authors showed that the volumetric measurements of NQ and DB were comparable, with good-to-excellent reliability in many brain regions; however, significant differences were noted between the mean normative percentiles obtained from NQ and DB. The distribution range of the normative percentiles was narrower for DB than for NQ. The authors demonstrated that the normative percentiles of NQ correlated with the cranial shape measured in terms of the transverse, anteroposterior, and craniocaudal cranial diameters. Although the same analysis was not performed for DB, it showed that cranial shape, which is presumably influenced by ethnicity, may contribute to differences in normative percentiles.

The normative percentile may act as a useful indicator and reference for interpreting brain volumetric results not only in a pathological context but also in a health-screening setting. The evaluation of quantitative volumetric information considering subject-specific parameters should be encouraged. While individual parameters such as age, sex, and head size are currently reflected in terms of total intracranial volume, there is a need for a population-based database that may reflect ethnic variations. The estimation of quantitative volumetric measurements with reference to thousands of matched normal subjects greatly enhances the clinical value of such results (5).

While the authors showed that there is a difference in normative percentile estimation between NQ and DB, future studies may be directed toward demonstrating the diagnostic implications of such a discrepancy. It may be hypothesized that normative percentiles based on the database of the South Korean population may better represent volumetric results and show improved diagnostic performance in predicting pathological conditions such as Alzheimer's disease in this population. While the authors showed that cranial shape may partly account for differences in the normative percentile, exploring other factors that may contribute to such discrepancies is required. Future research efforts should be directed toward constructing a comprehensive large-scale database of the South Korean population to provide normative reference data tailored to this population.

In summary, Yang et al. (4) provided evidence that the reference population and ethnicity contribute to significant differences in the normative percentile estimation provided by commercially available software. Ethnic variation may, in part, be accounted for by the cranial shape and is currently not reflected in the normative database. This underscores the need to construct a nationwide brain volumetry database to enable the personalized evaluation of volumetry results.

Conflicts of Interest

The author has no potential conflicts of interest to disclose.

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