Letter to the Editor

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MRI Morphometry of the Spinal Cord Depends on Several Factors That Must Be Taken Into Account When Selecting Healthy Volunteers

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I read with interest the article by Joo et al. [1] on a prospective 3T magnetic resonance imaging (MRI) study involving 28 healthy volunteers to calculate reference values for the cross-sectional area (CSA), anteroposterior diameter (APD), transverse diameter (TD), and compression ratios of the entire spinal cord [1]. CSA enlargement was observed at the cervical and lumbar levels, showing an elliptical (cervical) or circular (lumbar) shape [1]. The CSAs, APDs, and TDs were larger in men than in women [1]. The spinal cord compression ratio was lower in East Asians than in Caucasians [1]. Although this study was impressive, a few points should be discussed.

First, several factors affecting spinal cord dimensions were not considered when recruiting healthy volunteers [1]. Spinal cord volume may depend not only on age and sex but also on vascular supply, venous drainage, lymphatic drainage, spinal structure, and cerebrospinal fluid (CSF) production and circulation. Patients with atherosclerosis of the large or small arteries supplying the spinal cord may experience chronic hypoperfusion, which can lead to hypoxygenation and malnutrition, thereby leading to atrophy of the spinal cord [2]. In addition, vasospasms caused by cocaine use, for example, can lead to transient ischemia [3]. Venous congestion due to spinal varicosity or right ventricular insufficiency can lead to focal hypercapnia and secondary hypoxygenation. Impaired lymphatic drainage due to lymphadenopathy of local lymph nodes or traumatic spinal cord injury can lead to lymphedema of the spinal cord, leading to inaccurately high spinal cord volume measurements [4]. Genetic disorders affecting the spinal cord can go unrecognized for years if they are asymptomatic or only mildly symptomatic but are nevertheless associated with spinal cord atrophy. These include spinocerebellar ataxia, Chiari malformation, spinal muscular atrophy, mucopolysaccharidosis, and mitochondrial disorders. Considering these influencing factors, it is important to know how many subjects had diabetes, hyperlipidemia, hypertension, a genetic disease, or smoked. It is also essential to confirm whether patients with Hirayama disease, spinal cord injury, or an increased number of cervical or lumbar vertebrae were truly excluded from the study.

Second, the spinal cord can be affected by shrinkage and expansion. An increase in volume can be caused by edema, increased CSF production, or venous congestion. Furthermore, it is essential to confirm whether spinal cord enlargement was considered in all 28 subjects included in the study and whether its causes were truly excluded.

Third, the definition of "severe scoliosis" [1] was not provided in the methods section, nor what criteria were used to differentiate between severe, moderate, and mild scoliosis.

Fourth, the influence of current medications was not considered while recruiting healthy subjects. Since various medications can potentially affect the spinal cord volume [5], we should know how many of the included subjects were taking medications, such as L-thyroxine, glucocorticoids, or diuretics. Because dehydration can reduce the CSA [5], it is essential to know whether the subjects were sufficiently hydrated during the experiment.

To summarize, this study has limitations that put the results and their interpretations into perspective. Addressing these limitations can strengthen the conclusions

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and corroborate the findings of this study. Several factors influencing MRI morphometry of the spinal cord must be considered while selecting healthy subjects for inclusion in the analysis.

Conflicts of Interest

The author has no potential conflicts of interest to disclose.

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