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Poster Presentation

Cervical Spinal Cord Extraction in Patients with Multiple Sclerosis Using Magnetic Resonance Imaging for Measuring Cross-Sectional Area

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Abstract

Multiple sclerosis (MS) refers to the lesions that accumulate in the brain and spinal cord. Magnetic resonance imaging (MRI) is the most sensitive and versatile modality used to show changes in the tissues over time. There has been significant interest in evaluating the relationship between the brain atrophy and disease progression rather than the spinal cord atrophy. The cervical spinal cord has an important effect on the disease progression. Regarding the literature, spinal cord abnormalities in MS patients are more common in the cervical segments in comparison to the thoracic and lumbar regions. This study was conducted extract the spinal cord in MS patients from MRI images in the Department of Neurology, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran. In this study, 51 MRI images were obtained from 49 individuals, out of whom 28 were healthy (21 females and 7 males) and 23 had MS (17 females and 6 males). The participants aged between 21 and 45. The MRI images were normalized using an automatic image analysis method. Thereafter, the desired candidate areas were determined using data preprocessing, edging, and edge detection techniques. Appropriate areas were recognized by applying appropriate conditions and using prior knowledge about spinal cord and vertebrae. By measuring specific parameters that was conducted under the supervision of a consultant, as an input to a well-suited and well-used artificial neural network, it was decided if the person had MS or not. According to the Dyce index, 72% of the regions were accurately selected by the automated method presented in the image segmentation. In addition, we diagnosed MS by measuring the FP, FN, TP, and TN values in artificial neural network outputs with a precision of over 70%. With the help of the proposed method, we tried to find a simple and effective method for auto-segmentation of cervical MRI images with a specific purpose for parsing, measuring the parameters, and then diagnosing MS in patients. The method presented will be of great help to the physician regarding future decision making, and it is hoped that this method and its results, with improvement and implementation, will be used as a technique and accessible to all individuals related to this issue, especially physicians.

Keywords: Magnetic Resonance Imaging, Segmentation, Spinal Cord and Vertebrae, Image Analysis, Artificial Neural Network

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