

AUTOMATIC SEGMENTATION OF PERINATAL ARTERIAL ISCHEMIC STROKE VOLUME

N.E. van der Aa¹, I. Isgum², F. Groenendaal¹, M.A. Viergever², L.S. de Vries¹, **M.J.N.L. Benders¹**

¹*Department of Neonatology, Wilhelmina Children's Hospital, University Medical Centre Utrecht,* ²*Image Sciences Institute, University Medical Center Utrecht, Utrecht, The Netherlands*

Introduction: Diffusion weighted imaging (DWI) allows rapid diagnosis of ischemic tissue following perinatal arterial ischemic stroke. Current delineation of stroke is user-dependent. Aim of this study was to investigate whether stroke volume can be assessed automatically to perform user-independent measurements of stroke volume.

Methods: DWI scans of 12 full-term infants without any cerebral abnormalities (controls) were registered to the patient's DWI scan using the non-diffusion weighted image. Subsequently, apparent diffusion coefficient (ADC) maps of controls were transformed to the ADC map of the patient using corresponding transformations. Patient's ADC values 2.5 standard deviations below the mean ADC value of the controls were classified as ischemic.

The stroke volume was manually delineated four times using two different window widths and levels, and subsequently compared with the automatic segmentation. The Dice similarity coefficient (DSC) was calculated as similarity measure $(2 * (\text{overlap of segmentation1} \& \text{segmentation2}) / (\text{segmentation1} + \text{segmentation2}))$.

Results: Stroke volumes of 9 infants (scanned day 3-6) were segmented. DSCs of manual segmentations were lower when different window levels were used (.89, .85-.95) than when the same window level was used (.96, .92-1.0). The automatic segmentation resulted in a DSC of .86(.76-.93). Of interest was the automatic segmentation of ischemic voxels, which were not included in the manual segmentation, but on inspection did show relatively low ADC values suggesting penumbral tissue.

Conclusions: Automatic segmentation approaches similarity indices comparable with manual segmentations and may assist clinicians in the assessment of stroke volume and can be used as a tool to evaluate therapeutic intervention of stroke.