Methods:
We conducted a pilot study in a sample of 8 patients (mean age 72 years) with ischaemic lacunar or minor cortical stroke that had MR scans at the time of onset and around 2.5 years later. Subjects were participants in The Mild Stroke Study [2]. They underwent structural MRI, including T2-, T2*-, T1- and FLAIR-weighted sequences on a GE Signa LX 1.5T scanner. The MR images were pre-processed using FSL tools (http://www.fmrib.ox.ac.uk).

The WMLs were segmented by two basic methods: 1) thresholding FLAIR images using an optimized slice dependent threshold; and 2) MCMxxxVI [1].

In each method we tested several different approaches to image intensity normalization (IN) and bias field correction (BFC) resulting in 8 different processing experiments. They were performed by two trained analysts.

METHODS. REPRESENTATION OF THE RESULTS.

In the threshold method, volumes of non-stroke related WMLs and Stroke Lesions were obtained separately. However, with the MCMxxxVI method, the total volume of the hyper-intense lesions was obtained, and the stroke lesions were removed from the total lesion volume as a post-processing step.

Lesion volume differences after 2.5 years were obtained by subtracting the first time point WML volume from the second time point WML volume.

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Results:

- MCMxxxVI with previous visual adjustment of the intensity range of the T2*W and FLAIR sequences gives more consistent results.
- This method is less vulnerable to bias field inhomogeneities although, in general, BFC improved the results in both methods.
- For the thresholding method, these inhomogeneities generally lead to an overestimation of WML volume, particularly when "dirty" white matter areas are prominent.

Conclusions:

- Both methods are highly sensitive to intensity changes.
- Similar and more consistent results were obtained by:
  - MCMxxxVI with and without bias field correction
  - Thresholding in FLAIR with previous bias field correction and intensity normalisation

References: