Automatic vs. Manual Volumes

Auto Volume (ml) vs Manual Volume (ml)

R = 0.988
p < 0.0001
n = 51
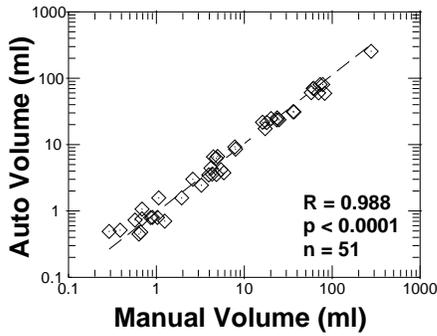
Manual/Auto Volume Difference

Volume difference (%) vs Lesion Volume (ml)
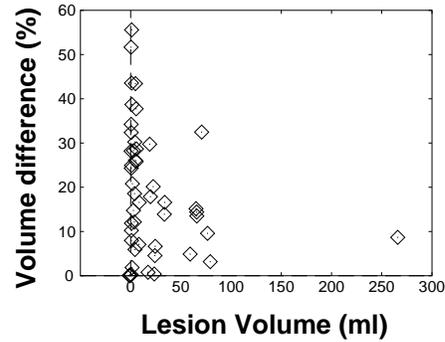
Orientation 1 vs. 2, Manual

V2 (ml) vs V1 (ml)

R = 0.992
p < 0.0001
n = 17

Orientation 1 vs. 2, Auto

V2 (ml) vs V1 (ml)

R = 0.999
p < 0.0001
n = 17
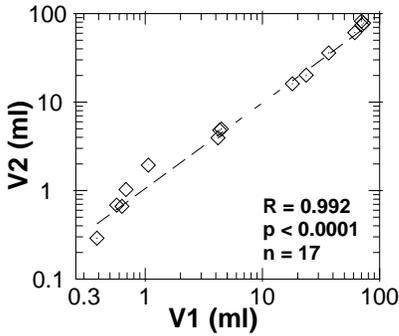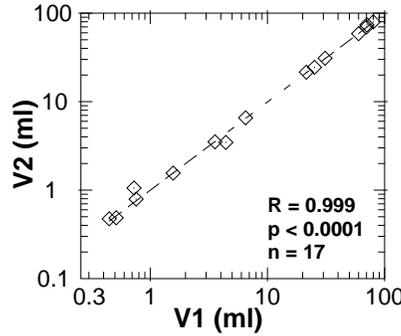
Orientation 1 vs. 2 Volume Difference

Volume difference (%) vs Lesion Volume (ml)

◇ Manual
+ Automatic
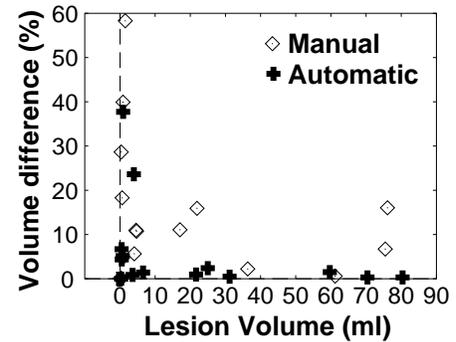
Methods: 19 patients with progressive multifocal leukoencephalopathy, multiple sclerosis or HIV WML were studied. One to four lesions were evaluated for each patient, for a total of 34 lesions. All patients were imaged with the same FLAIR sequence (TE=140, TR=10000, TI=2200, 5mm slice thickness). For 9 patients (17 lesions), repeat scans were acquired within 30 minutes with patient repositioning (**Figure, top row**).

The manual method consisted of outlining the edges of the lesions on all slices containing the lesions, using a mouse and dedicated software which allowed the operator to draw and edit polygonal lines on the magnified FLAIR images. The automatic method consisted, for each selected lesion, of the three-dimensional seed-and-explode algorithm presented with respect to patient orientation (**Figure, bottom row**), the automatic method proved much more reproducible than the manual method for larger lesions: for the 7 lesions with volume $\geq$ 5ml, the average and maximum relative volume differences were 9% and 16% for the manual method, and only 1.1% and 2.4% for the automatic method. We conclude that much care must be taken when attempting to quantify lesions smaller than 5ml on a digital computer, and that the automated method proved efficient at reducing quantification uncertainty due to scanning orientation.

REFERENCE:

1. L Itti *et al.*, Proc. 5th ISMRM, p. 418, 1997