

ON-LINE APPENDIX

Part 1: The Shortest Distance from the Tumor to Midpoint between Both Ends of the Hand Knob (D-min)

To calculate D-min, the coordinates of both ends of the hand knob points were collected, such as points A (X_a, Y_a) and B (X_b, Y_b) (Fig 1A). The midpoint [point C (X_c, Y_c)] of the hand knob was calculated by using the following formula:

$$1) \quad X_c = \frac{X_a + X_b}{2} \quad Y_c = \frac{Y_a + Y_b}{2}.$$

Subsequently, only point D (X_d, Y_d) on the tumor boundary was identified, which was nearest to the midpoint (point C). The D-min could be calculated via the following formula. The value of k_x and k_y equaled 1 because each voxel size was 1×1 mm.

$$2) \quad d = \sqrt{[(X_c - X_d) \times k_x]^2 + [(Y_c - Y_d) \times k_y]^2}.$$

Two radiologists identified the tumor boundaries from the T2-weighted images independently. If their selections differed by >5%, a third senior radiologist with >20 years of neuroimaging experience made the final decision.

Part 2: The WAN Model

To calculate the DD, we applied a mathematic model called the WAN model (Fig 1B). In this model, we concentrated on the distance from the lesion lateral to the hand knob midpoint (point I) and the point (point H') that mirrored the healthy lateral hand knob midpoint (point H), based on the brain midline (blue dotted line, Fig 1B). We calculated the coordinates of the midpoint [point H (X_h, Y_h)] on the healthy hemisphere and the midpoint [point I (X_i, Y_i)] on the lesioned hemisphere using the process that was introduced in Part 1. In addition, we calculated the midline. Both point E

(X_e, Y_e) and point F (X_f, Y_f) were located on both sides of the falx cerebri intersection. According to their coordinates, the equation of line EF (l_{EF}) was calculated by the following formula:

$$3) \quad l_{EF}: \quad y = kx + m, \quad k = \frac{Y_e - Y_f}{X_e - X_f} \quad (X_e - X_f \neq 0),$$

$$m = \frac{X_f Y_e - X_e Y_f}{X_f - X_e},$$

Or

$$l_{EF}: \quad X = X_e \quad (X_e = X_f).$$

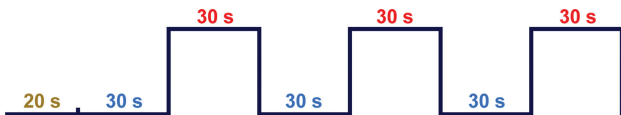
Subsequently, we calculated the midpoint H' ($X_{h'}, Y_{h'}$), which mirrored point H (X_h, Y_h), based on line EF via both formulas (Equations 4 and 5), or via Equation 6 only. Finally, we obtained the DD by using the formula (Equation 2) with the coordinates of point I and point H'. (The value of k_x and k_y equaled 1 because each voxel size was 1×1 mm).

$$4) \quad (Y_{h'} - Y_h)/(X_{h'} - X_h) = -1/k \quad (X_e \neq X_f),$$

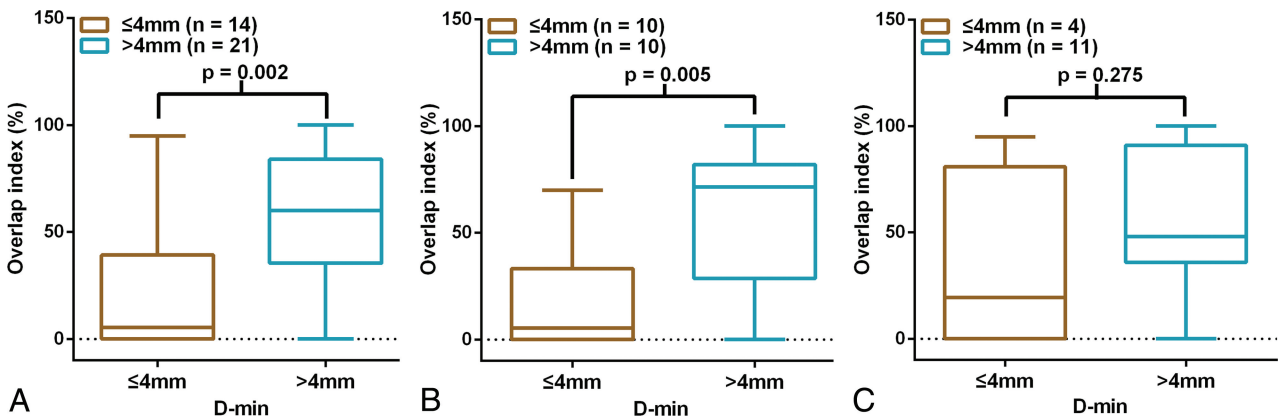
$$5) \quad \frac{Y_h + Y_{h'}}{2} = \frac{k(X_h + X_{h'})}{2} + m \quad (X_e \neq X_f),$$

Or

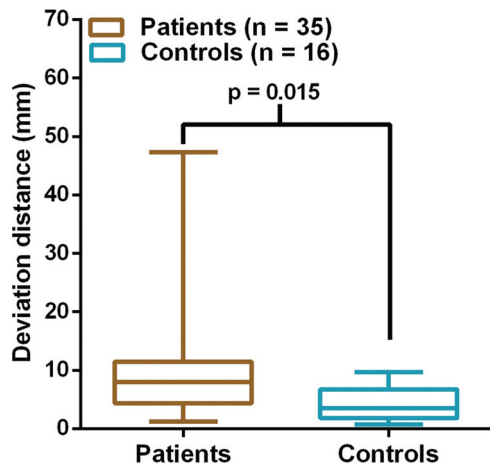
$$6) \quad X_{h'} = \frac{2X_h - X_e}{2}, \quad Y_{h'} = \frac{2Y_h - Y_e}{2} \quad (X_e = X_f).$$



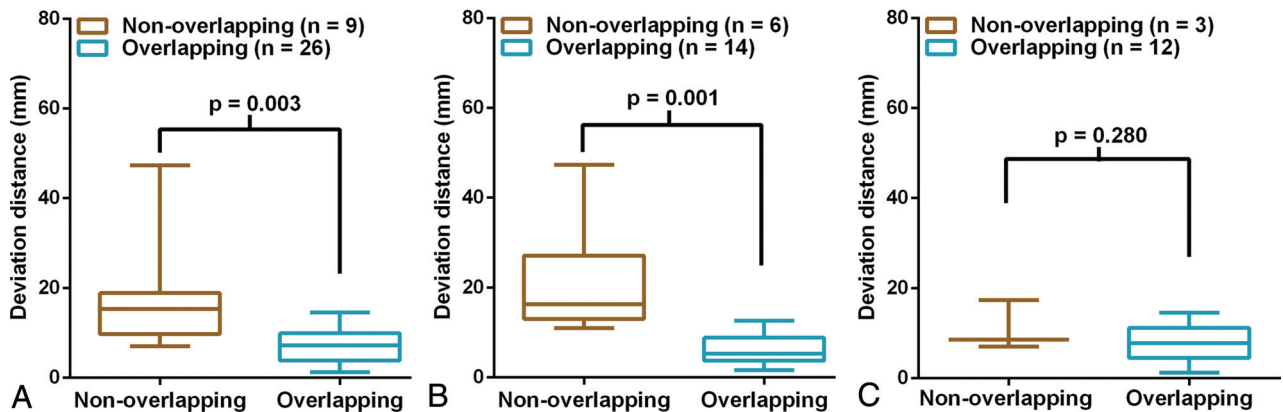
ON-LINE FIG 1. Illustration of the block design. Colored text indicates the amount of time during which patients were instructed to relax (yellow), grasp their hands (red), or rest (blue).



ON-LINE FIG 2. Boxplots showing the relationship between D-min and the overlap of BOLD fMRI and DCS results. The middle line of each box corresponds to the mean value; the first and third lines represent the mean \pm SD. P values were obtained via t tests. A, In all patients, the overlap index was significantly different between the ≤ 4 - and > 4 -mm groups. B, In group A, there was a significant statistical difference in the overlap index between the ≤ 4 -mm and > 4 -mm groups. C, In group P, there was no statistical difference in the overlap index between the ≤ 4 -mm and > 4 -mm groups.



ON-LINE FIG 3. Boxplot showing the degree of symmetry between the hand knob midpoints on both sides of the brain, as assessed by the DD values calculated with the WAN model. The middle line in each box shows the mean value; the first and third lines represent the mean \pm SD. The degree of symmetry was significantly different between the patient and control groups (*t* test).



ON-LINE FIG 4. Boxplots showing the relationship between the DD values and overlap of BOLD fMRI and DCS in different groups. The midline in each column shows the mean value; the first and third lines represent the mean \pm SD. Statistics were calculated via *t* tests. A, In all patient groups, the DD was significantly different between the overlapping and nonoverlapping groups. B, In group A, there was a statistically significant difference in the DD between the overlapping and nonoverlapping groups. C, In group P, there was no statistical difference in the DD between the overlapping and nonoverlapping groups.