Brain mapping of motor and functional recovery after supratentorial stroke

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Objectives
The present study aimed to identify the brain regions involved in upper and lower limb motor and functional recovery after stroke.

Methods
Twenty-five patients (mean age, 73.4 years; average duration from stroke onset, 50.1 months) were examined. Fractional anisotropy (FA) mapping using diffusion tensor imaging, and clinical measures, including the Fugl-Meyer motor assessment of upper and lower limbs, the Modified Barthel Index, and Functional Ambulation Category were used for examinations. Linear regression analyses were conducted with the FA map as a dependent variable, each clinical measure as an independent variable, and patient age as a covariate.

Results
FA in the internal capsule of the posterior limb of the lesioned hemisphere was significantly associated with Fugl-Meyer motor assessment scores for the upper limbs, whereas that in the internal capsule of the posterior limb of the lesioned hemisphere, posterior corpus callosum of the lesioned hemisphere, and middle cerebellar peduncle of the contralateral hemisphere was associated with Fugl-Meyer motor assessment scores for the lower limb. FA in brain regions with bilateral connection fibers was commonly associated with the score on the Korean version of the Modified Barthel Index and participants' functional ambulation. Furthermore, the FA in the corticospinal tract in the contralesional hemisphere was also associated with the score on the Korean version of the Modified Barthel Index (corrected $p < .05$).
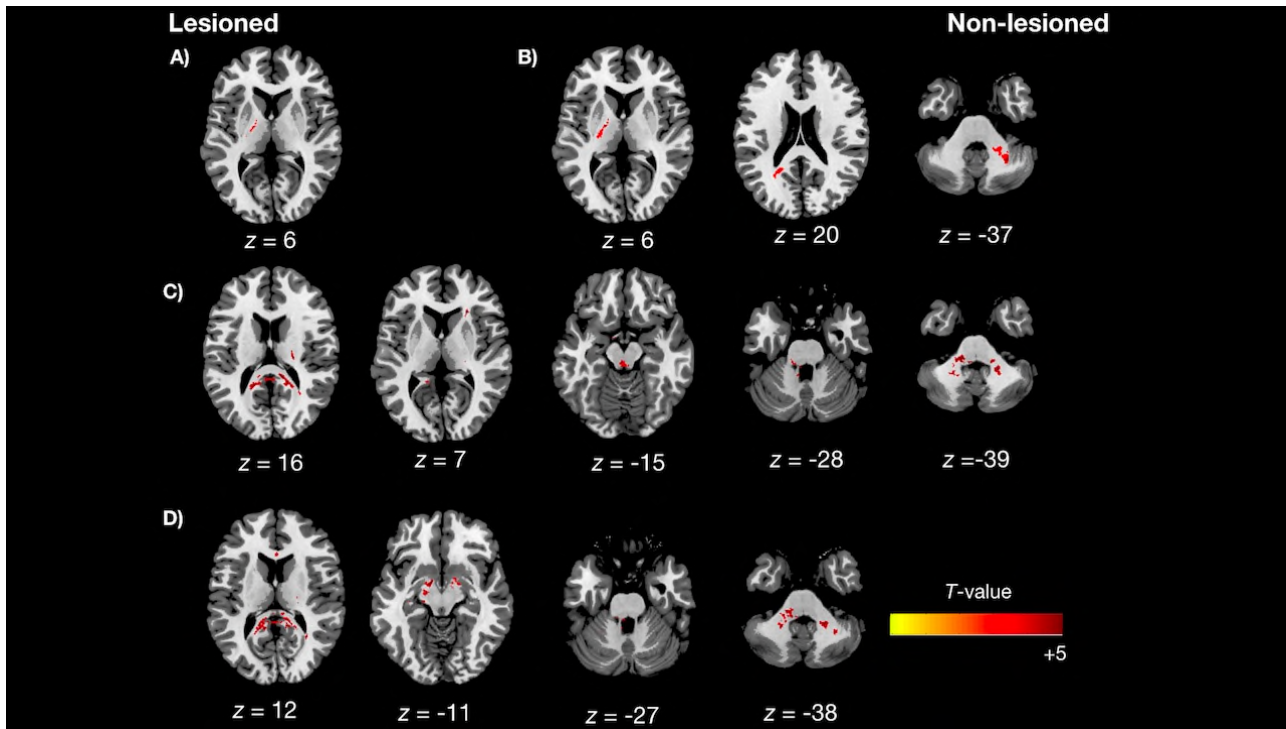
Conclusions
Motor and functional recovery of upper and lower limbs involves different brain regions. This finding is of particular relevance for treatment and recovery in stroke
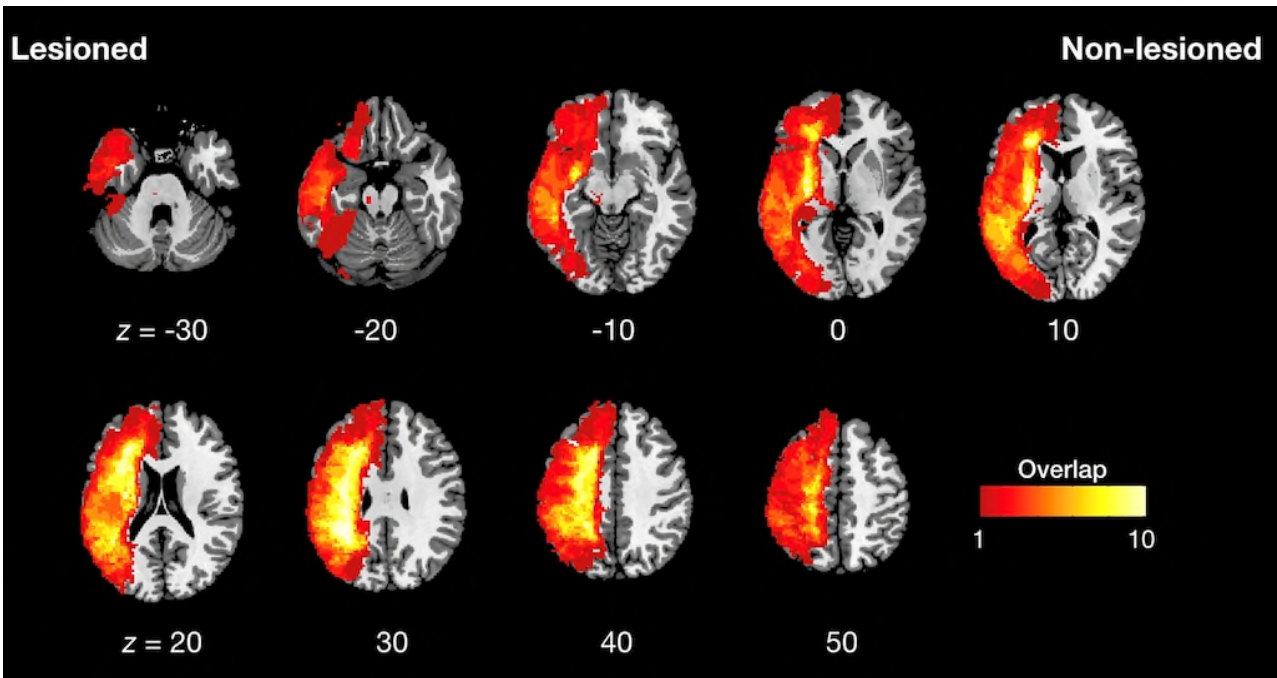
The color scale indicates the number of overlapping lesions in each patient.

A, FMUL; B, FMLL; C, MBI; D, FAC

Patient	Sex	Age	Duration (months)	Lesional hemisphere	Lesion volume (cm³)	FMUL	FMLL	MBI	FAC
1	male	68	13.7	Left	4.1	34	22	56	2
2	male	66	18.6	Left	3.8	65	33	97	4
3	male	71	317.4	Left	150.7	40	25	8	1
4	male	70	42.9	Left	17.6	50	26	83	4
5	male	65	11.9	Left	57.9	52	30	91	4
6	male	84	6	Right	11.7	34	19	62	2
7	male	87	3	Right	15.0	32	19	0	0
8	male	71	31.2	Left	2.2	56	31	89	4
9	male	70	71.5	Left	143.1	43	27	88	5
10	male	74	5.6	Right	5.3	64	34	100	3
11	male	89	21.4	Left	21.1	52	30	84	3
12	male	73	9.3	Right	4.4	63	26	97	5
13	male	73	9.3	Right	2.3	11	9	55	2
14	male	71	117.4	Right	26.4	32	14	69	3
15	male	68	297.8	Right	93.7	30	14	57	2
16	male	74	8	Right	48.1	4	4	7	0
17	male	73	6.5	Left	2.9	30	11	79	3
18	male	95	34.3	Right	82.0	18	11	9	0
19	male	73	21.4	Right	2.9	20	27	78	4
20	male	72	24.3	Right	10.7	5	17	77	4
21	male	72	24.2	Left	173.9	4	4	63	3
22	male	70	12.3	Right	262.8	4	4	1	0
23	male	67	27.3	Right	2.0	4	10	72	4
24	male	69	16.6	Right	186.1	4	9	54	4
25	male	71	98.3	Right	1.2	5	7	49	2

Table 1. Patient characteristics

Duration, duration after stroke; FMUL, Fugl -Meyer motor assessment for upper limb; FMLL, Fugl -Meyer motor assessment for lower limb; MBI, modified Barthel index; FAC, functional ambulation category

Patient characteristics