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Hemispatial Neglect in Acute Stroke: A Window on Neural Correlates of Spatial Processing

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The traditional chronic lesion/deficit correlation approach to identifying the neural substrates of cognitive functions is complicated by the facts that most patients with chronic deficits have large strokes, and that patients undergo reorganization of structure/function relationships after brain damage. I will illustrate how these limitations can be avoided by studying cognitive functions in consecutive patients immediately after both large and small strokes, before substantial reorganization or recovery. In a series of studies, my colleagues and I have identified selective deficits in spatial attention to the contralesional sides of space (defined by the viewer's midsagittal plane), of visual stimuli, or canonical representations of objects, that are each associated with infarct or hypoperfusion of a focal brain region, as documented with magnetic resonance perfusion and diffusion-weighted imaging. We have also found that reperfusion of each of the identified regions (in the absence of infarct) results in recovery of the associated deficit. Furthermore, we have found that more severe hypoperfusion of each region is associated with more severe impairment of the associated hemispatial neglect. These data provide evidence for proposing the neural regions that are essential for specific language functions, and thus complement functional imaging studies that reveal neural regions that contribute to particular functions. Finally, I will review new evidence that right hemispatial neglect is common after left cortical infarcts or hypoperfusion in acute stroke, but the distribution of types of hemispatial neglect is very different from the distribution of types of hemispatial after acute right hemisphere stroke. These data indicate that the hemispheres may play distinct but equally important roles in spatial processing.