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Could saccadic function be a useful marker of stroke recovery?

Tim Anderson

There is no pharmacological therapy presently available to improve the long-term recovery from acute ischaemic stroke. Either there hasn't yet been a suitable treatment trialled, or the tools for measuring recovery have not been sensitive enough. It is critical therefore to continue to search for robust objective markers of stroke recovery in parallel with the push for drug discovery. Can saccade measures provide such a marker? Dong *et al* report that in a limited number of mild stroke patients, saccadic parameters that probe cognitive function, especially errors of inhibition during antisaccade and memory-guided paradigms, were abnormal immediately after stroke and improved over time but not to normal.[1] These saccade measures appeared to be more sensitive than clinical assessment scales in reflecting initial cognitive impairment and recovery. The authors argue that such measures might provide useful and objective markers of cognitive recovery following stroke, and less time consuming than neuropsychological testing.

The application of eye movement recordings following stroke is not new, but their use as biomarkers of stroke severity and recovery, as suggested by Dong *et al*, is novel. Though earlier studies conducted in patients with stable solitary ischaemic lesions have contributed much to our understanding of the functional neuroanatomy of cerebral eye movement areas and pathways[2] they did not explore the opposite approach—the possible utility of eye movement recordings in informing on impairment from stroke.

The ability to easily and precisely record saccades has already led to their use as a marker of disease status, especially in progressive neurodegenerative disorders such as Huntington's disease, Parkinson's disease and spinocerebellar ataxia, but also multiple sclerosis and head injury—all conditions in which neuronal affectation is widely distributed in the brain. It is anticipated that saccade parameters will be useful in reflecting disease progression and response to neuroprotective or restorative therapies. The employment of saccadic parameters as biomarkers is still in its infancy, however, and yet to be proven useful. For example, in preclinical and early Huntington's disease, progression of saccadic impairment has not been as clear-cut as progression of MRI and some other clinical markers.[3]

If oculomotor measures are to be seriously considered as reliable disease biomarkers, they must be shown to be stable on repeated acquisition in the short term, and show progression in close concert with other disease parameters in the medium and long term. So, are laboratory recordings robust and repeatable in individual patients in the short term? Disappointingly, this imperative has been little studied and there is an urgent need for quality studies in large healthy control and patient cohorts.

Another stumbling block to possible widespread application of oculomotor recordings to document stroke recovery, and indeed other neurological disorders, is that thus far the methodology is restricted to specialised laboratories. The availability of a cheap, robust and easily deployed portable apparatus that can be used by non-technicians (for example, physiotherapists or occupational therapists) is necessary for any future take-up. Such apparatus' are in use[4] but need further refinement.

Where to from here? The study of Dong *et al* is an encouraging pilot but there is now need for a cross-sectional then longitudinal follow-up study of saccades in much larger and well-clarified cohorts before we can determine whether such measures might be employed in future trials of putative therapies targeting improved recovery from acute stroke.

Correspondence to Professor Tim Anderson, Department of Medicine, University of Otago, NZBRI, 66 Stewart Street, Christchurch 8011, New Zealand; Tim.anderson@cdhb.health.nz

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