Stroke is the most common cause of long-term adult disability, yet sufferers at the chronic stage (more than 6 months post stroke) are left with few options for rehabilitation.

However, Associate Professor Winston Byblow, Dr Cathy Stinear and colleagues at the University of Auckland’s Department of Sport and Exercise Science are working to change this through an HRC-funded project.

Associate Professor Byblow says that when chronic stroke patients exit the health care system there is often residual weakness in the legs, hands and arms, but real gains in function can still be made after this point. Their study is examining how to increase the responsiveness of the brain so that patients can make further improvements.

The project is examining the effectiveness of novel therapy designed by the Auckland researchers to improve function of the stroke-affected upper limb in chronic stroke patients. Known as Active-Passive Bilateral Therapy (APBT), this therapy involves movement of the unaffected hand which passively drives the affected hand through rhythmical bilateral mirror symmetric wrist flexion-extension.

From this project, the team developed and recently completed a study led by Dr Stinear, to see what measures would predict chronic stroke patients’ capacity for recovery. Their findings were published in the January 2007 issue of the journal Brain.

The study used both transcranial magnetic stimulation (TMS) and a novel type of MRI analysis - diffusion tensor imaging (DTI), to assess the integrity of the corticospinal tract (the main pathway carrying signals from motor areas of the brain to the spinal cord). Using these two techniques, the team developed an objective measure of pathway integrity that assessed the damage due to stroke. These measures predicted patients’ capacity for recovery of hand function, as assessed from clinical scores.

Patients that retained roughly half of the corticospinal tract on the stroke-affected side, when measured within a region known as the internal capsule, demonstrated good responsiveness and improved function following one month of motor practice with the affected hand. Below this critical level, recovery did not occur. Using functional MRI it was determined that patients who responded to therapy activated the stroke affected side of the brain when they used their affected hand, but those who did not, activated the side of the brain that is used to control their good hand. The team also found that you cannot tell how well someone might respond to therapy simply by determining how well they use their hand when they begin therapy.

“With this technology we've been able to reconstruct the pathways in the brain to see how they've been affected using an objective measure with good precision, and make strong predictions about potential for motor recovery,” says Associate Professor Byblow.

Dr Stinear says that alone, these techniques (TMS and MRI) don't quite tell the whole story, but when used together, you get a much clearer picture of how somebody is going to do.

“This study represents a massive enhancement of the HRC-funded project at no additional cost,” she says.

The main study is currently recruiting their last cohort of patients and the team expect to present their findings towards the end of the 2007.

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