Disorder: Stroke

Title: Working together to promote brain recovery

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We so often think of the elderly when faced with the issue of tackling brain injury after stroke and in doing so we forget that stroke also strikes young people too. But no matter what the age, the exciting reality is that many brain injuries don't have to result in permanent loss of functions. We now know that the brain can be stimulated to remodel and repair. It's just finding the right combination of approaches to stimulate this response that remains to be clarified. So whilst there are no magic cures for brain injury, there are many new non-invasive therapies underway in clinical trial that are having some dramatic and surprising results in promoting brain recovery, even many years after the initial stroke event.

It is important to get to a hospital quickly if you are having a stroke. Restoration of blood flow to the affected brain region can ultimately reduce the size of injury that may occur. However this is not always possible, as many people live long distances from medical care or do not even know that they are having a stroke when it occurs. To improve public awareness, campaigns to promote the signs of stroke have been devised which include easy to remember assessment criteria. Act FAST! Face: can you smile? Arms: can you raise your arms above you head? Speech: can you speak your name? Time: if a person is unable to perform these tasks then go to a hospital [1]. Early medical intervention can reduce the loss of function associated with stroke induced brain injury.

It was for a long time thought that if stroke was not detected early, then nothing could be done (apart from preventing repeated episodes) and that irreversible brain damage would ensue with permanent loss of functions. As is so often the case in science, what we think we know doesn't always turn out to be the case. In fact a slow but consistent recovery can be observed in stroke patients during rehabilitation over months without drug mediated intervention. Research now suggests that the injured brain is primed for repair processes and that brain rewiring can be stimulated to occur, even years after the damage, through intensive physical re-habilitation and environmental enrichment.

Rewiring the brain requires stimulation of surviving nerve cells just outside of the injured territory in order to encourage these cells to make new connections with different cells. To this affect bypassing the damaged site to restore lost functions. Whilst existing brain and physical exercises have been important in helping with this process, new approaches are currently in trial around the world. One such approach is the use of 'Constraint Induced movement Therapy', mostly used for re-development of motor activities [2]. The basis of this approach is that compensation with the less-impaired limb may impede recovery of the more-impaired limb. This process involves combined restraint of the unaffected limb with intensive use of the affected limb, in order to force the affected limb to 'learn' how to work again. It's not an easy process, since it requires nearly all waking hours with long periods of supervised structured tasks involving the affected limb over many weeks. For some, positive results are being reported with constraint therapy even in people who have been disabled for many years. However, two key factors have emerged as being vital for its success; these include complete concentration on repetitive tasks, and compliance to constraining the functional limb for 90% of waking time. More research is required to determine if the later part of the protocol is truly necessary, and that perhaps repetitive tasks applied to the affected limb alone would be sufficient itself to improve recovery.

Another approach to brain rewiring may also be found with the use of device-orientated approaches. These utilize similar technology to that used in bionic ear implants, which enable the hearing impaired to hear for the first time. The use of bionics has long been bridging the gap between what is and what is not possible. In a recent new discovery by Professor Randolph Nudo, a novel electronic microsystem [3] implanted into the damaged brains of rats has been shown to bridge the gap between disconnected brain regions, resulting in restored function [4]. Additionally the device also served to guide new nerve fibers in the right direction in order to re-map a lost pathway and restore its connection. Even when the devise was turned off, long term restoration of motor function was achieved. While these latest studies have only been tested so far in animal models, electronic devises have been used to restore hearing and are currently in clinical trial for the restoration of sight. It is therefore not out of the question that smart prosthetic devices may in the future have an application in human stroke.

We once thought that the human brain if damaged resulted in irreversibly lost functions. Decades of research have now shown this to be untrue, and that lost functions may be restored if given the right opportunity. But there is not going to be just one 'right' approach to fix the complex problem of brain injury. It will take a combination of approaches that may incorporate the use of multiple technologies. It will take ongoing collaboration of experts across many fields of science working together. But where once the problem appeared beyond resolution, we now know that there is hope, and with new ideas we are already starting to see brain recovery occurring in many people, where previously none was thought possible.

Bibliography

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