Stentrode — on way to revolutionize neurosciences

Ansab Godil, Muhammad Yusuf Hafiz, Maria Shoaib

Getting things done just by giving it a thought seems unrealistic fairy tale or friction, however due to biotechnological advances this is a possibility now. Scientists at the University of Melbourne have collaborated to introduce a novel device 'stentrode' (stent covered in small electrodes) that is maneuvered and implanted into cerebral veins overlying the motor cortex.[1]

Its working principal is based upon its Electrodes within the stentrode, which pick up neural frequencies from the motor cortex and decode into voluntary commands for assistive devices like the exoskeleton. This 'brain-machine interface' has been implanted successfully into sheep and has yielded chronic nonattenuated signal recordings similar to those recorded from traditional electrocorticography arrays implanted into the brain. Prospectively with this transducing brainwave into volitional movements, it can be a possibility that in future paraplegics would be able to move their robotic harnesses with the power of thought. There have been attempts at developing neural interface systems for patients afflicted with stroke and spinal cord injuries, the electrodes implanted into the motor cortex will pick up the brain signals.[2]

WHO reports stroke amongst the leading cause of death and disability in the world. Stroke together with spinal cord injuries (SCI) constitute the majority causes of limb paralysis and chronic disabilities. Hence there is dire need to find an effective rehabilitation modality for these seemingly irreversible medical conditions.[3,4]

Stentrode like biocompatible neuroprostheses would induce a paradigm shift in the approach towards motor rehabilitation and lead to improved quality of life for the afflicted patients. These powered exoskeleton bionic devices would be fed into the human brain and possibly enable the person to carry out a movement just by thinking. Forthcoming apart from assisting paralyzed patients, there is a potential outcome that it might also help in a variety of medical conditions. A few promising applications include predicting and managing seizures in epilepsy, Parkinson's disease and obsessive-compulsive disorders.[4,5]

Also, the stentrode may bypass the need for craniotomies, developing minimally invasive approaches that avoid brain trauma and inflammation. It can help feasibly recording brain activity from within a vein using a passive stent-electrode recording array. It heralds a low risk brain parenchymal access to the surgeons. This will surely revolutionize the neuro surgical frontiers by providing a micro-working channel.[1]

The device is expected to undergo its first human trial at The Royal Melbourne Hospital by 2017. Neurologists and the Bio Medical engineers have hailed it as the 'holy grail of bionics', let's look forward to its success and the times when stentrode will be practically available aiding in eliminating disabilities and suggesting new domains to the neuroscience.[4]

Dow Medical College, Dow University of Health Sciences, Karachi.
Correspondence: Muhammad Yusuf Hafiz.
Email: m.yusufhafiz17@gmail.com

References

1. Oxley TJ, Opie NL, John SE, Rind GS, Ronayne SM, Wheeler TL, et al. Minimally invasive endovascular stent-electrode array for high-fidelity, chronic recordings of cortical neural activity.Nat Biotechnol. 2016; 34: 320-7.
2. Hochberg LR, Bacher D, Jarosiewicz B, Masse NY, Simeral JD, Vogel J. Reach and grasp by people with tetraplegia using a neurally controlled robotic arm. Nature. 2012; 485: 372-5.
3. Mukherjee D, Patil CG. Epidemiology and the global burden of stroke.World Neurosurg. 2011; 76:85-90.
4. The Guardian. Bionic spinal cord helps stroke victims walk again. (Online) (Cited 2016 Feb 11). Avaiable from URL: http://guardian.ng/features/bionic-spinal-cord-helps-stroke-victims-walk-again/.
5. Challenges in Automation, Robotics and Measurement Techniques In: Szewczyk R, Zielinski C, Kaliczynska M, eds. Proceedings of AUTOMATION. Warsaw Poland: Springer, 2016.