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Ultrasound imaging of blood flow changes following spinal cord injury

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Traumatic spinal cord injury (tSCI) causes an almost complete loss of blood flow in the injury center as well as hypo perfusion of adjacent tissue (penumbra), resulting in secondary cell death over-time. The disruption of blood vessels and subsequent haemorrhage and edema after tSCI leads to an increase in intraspinal pressure (ISP) and a growing zone of ischemia and secondary injury in tissue adjacent to the primary contusion. A biomarker to identify ischemic changes in spinal cord tissue could help guide and assess neuro-protective treatment strategies for tSCI and potentially other situations. Intraoperative ultrasound imaging of the spinal cord enables the leveraging of the most recent advances. Using these advances, we have recently developed ultrafast contrast-enhanced ultrasound (CEUS) Doppler imaging of blood flow, which enables the segmentation and investigation of micro vascular flow (<30 mm/sec) not previously possible. Ultrafast plane wave acquisitions (>30,000 frames/second) and Doppler processing with microbubbles enables segmentation of blood flow in the entire vascular tree by velocity, providing access to the distribution of velocities at each level of flow. This combination of ultrafast imaging and nonlinear pulsing sequences enables for the first time the investigation of microvascular hemodynamics. This approach has been used to investigate hemodynamic changes in a rodent contusion tSCI model, where it was found the extent of hypoperfused spinal cord tissue correlates significantly to injury severity and functional outcome. Motivated by these observations, we seek to develop an early ultrasound-based non-invasive real-time biomarker of microvascular hemodynamics for tSCI and other applications.

Recent publications:

Matthew Bruce, Dane De Wees, Jonah Harmon, Lindsay Cates, Zin Z. Khaing, Christoph P. Hofstetter, Blood Flow Changes Associated with Spinal Cord Injury Assessed by Non-linear Doppler Contrast-Enhanced Ultrasound, Ultrasound in Medicine & Biology, Volume 48, Issue 8, 2022, ISSN 0301-5629 https://doi.org/10.1016/j.ultrasmedbio.2022.03.004.

Biography

Matthew F. Bruce received his Ph.D. degree in bioengineering from the University of Washington, Seattle, WA, USA. He previously worked for Philips Medical Systems, Bothell, WA, USA, and Supersonic Imagine, Aix-en-Provence, France. He is currently with the Applied Physics Laboratory, University of Washington. His interests include clinical and pre-clinical ultrasound imaging of tissue and blood flow.

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Cognitive stimulation through Oroi Cognitive, a virtual reality app for older people

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Statement of the Problem: As we well know, age is a risk factor for the appearance of multiple diseases associated with cognitive impairment, such as dementia. Longitudinal studies suggest that around 10 years before dementia a subtle cognitive impairment begins, which is why it is interesting to carry out an early intervention with this group. The objective of this research is to evaluate the efficacy of cognitive stimulation through the Oroi Cognitive application in older people, as well its acceptance and appeal to them.

Methodology & Theoretical Orientation: The research was carried out with 31 participants with a number two or three in the global deterioration scale (GDS). 15 of these participants were part of the control group, and 16 of the experimental group. The intervention through virtual reality, with exercises more similar to day-to-day activities, allows working on attention, language, memory, orientation, visuospatial skills and executive functions. It was carried out in 12 sessions, 3 times a week, lasting 25 minutes each one, individually. Both groups were evaluated using the MINI-MENTAL Cognitive Examination and some subtest of the Weschler Intelligence Scale for Adults (WAIS-IV).

Pretest and postest measures in people with GDS2

WAIS-IV Subtests	Control group				Experimental group					
	Pretest		Postest		Pretest		Postest			
	Average±TD	N	Average±TD	N	Average±TD	N	Average±TD	N	p	Eta^2
Vocabulary	8.33±0.57	3	4.67±2.51	3	5.38±5.82	8	8.13±5.35	8	.048	.368*
Information	8.67±2.51	3	8.67±2.51	3	7.62±4.65	8	7.88±3.94	8	.860	.004
Cubes	6.67±1.52	3	6.00±3.00	3	5.13±4.05	8	7.00±1.19	8	.365	.092
Symbol search	6.67±1.52	3	7.67±1.15	3	6.75±3.57	8	5.63±1.84	8	.373	.089

Note: TD = typical deviation; n = number of participants; p = probability level; * $p < .05$; Eta^2 = eta square value

Findings: Regarding to the effectiveness of the stimulation, the results show significant improvements in vocabulary and information in those with GDS2, in the experimental group. No statistical improvements were found in the rest of the areas. Regarding to the assessment if the tool, 69& of the participants rated it as quite useful and interesting. According to the qualitative data collected by the therapists, the users were happier and more animated during and after the intervention. Conclusion & Significance: From the observed results, we can say that cognitive stimulation through Oroi Cognitive reduces cognitive deterioration in older people, and improves it in the areas related to language. In addition, being an attractive and entertaining intervention for this group.

Recent Publications:

1.Amaya A., Woolf, C., Devane, N., Galliers, J., Talbot, R., Wilson, S., Marshall, J. (2018). Receiving aphasia intervention in a virtual environment: the participant's perspective. Aphasiology, 32(5): 538-558.

2.Cipresso, P., Chicchi, I.A., Alcañiz, M., Riva, G. (2018). The past, present and future of virtual and augmented reality research: a network cluster analysis of the literature. Frontiers in Psychology, 9: 2086.

Biography

Adriana studied psychology and has a master's degree in general health psychology and in clinical neuropsychology. She has her expertise in cognitive stimulation and wellbeing in adults and older adults. Her model of cognitive stimulation is based on working every cognitive function in a similar way as we use it in day-to-day activities. She has been working designing virtual reality applications for people with mild cognitive impairment.

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Effects of botulinum toxin in cervical dystonia and impact on quality of life

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Introduction: Cervical dystonia (CD) is a disabling illness that interferes with activities of daily living and also has significant adverse impact on patient's physical and mental well-being. Botulinum toxin injection is an effective treatment for CD. The present study was designed to evaluate whether the impact of Botulinum toxin injection also extends to change in the quality of life (QoL) of patients along with improvement in the motor symptoms.

Materials and methods: It was a prospective observational study done in the Department of Physical Medicine & Rehabilitation, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, which included 7 cases of CD. The dose of injection Botulinum toxin A was determined by clinical examination of the involved muscles. Assessment of the patients was done Pre-injection (0 week), Post-injection (2 weeks) and Follow-up (6 weeks & 12 weeks).

The assessment tools were-

1.   Fahn-Marsden Dystonia Severity Scale [Quantitative assessment of dystonia]
2.   Cranio-cervical Dystonia Questionnaire-24 (CDQ-24) [Disease specific QoL]
3.   Cervical Dystonia Impact Profile-58 (CDIP-58) [Measure of health impact of CD]

Results: All the patients showed improvement in almost all the scores, in severity of dystonia, as well as in QoL. The patients were better post-injection both clinically and symptomatically. One patient suffered from mild dysphagia after the injection, which improved gradually during follow up.

Conclusion: Botulinum toxin A is an effective treatment of cervical dystonia which can lead to improvement in dystonic symptoms as well as the QoL of patients.

Recent publications:

1. Saha S, Laisram N, Gupta A. Effects of Robot Assisted Therapy as an Adjunct to Conventional Therapy in Upper Limb Motor Recovery after Stroke. Journal of Medical Science and Clinical Research 2016;4(11):13978-13986.

2. Laisram N, Saha S. Ambulatory Potential in Children with Cerebral Palsy. Indian J Phy Med Rehab 2017;28(2):49-52.

3. Kundu S, Mitra R. Majumder A, Saha S, Misra S. Primary Lymphoepithelioma-like Carcinoma of the Lung in a 13 year old Girl. Oman Medical Journal 2012;27(1)

4. Ghosal A, Saha S. Das S, Gangopadhyay S, Sengupta M. The ring in the neck-managing paraparesis in cervical intramedullary tuberculoma: Inputs from a neurorehabilitation desk, Indian Journal of Tuberculosis,

5. Goyal V, Saha S, Gupt SK, Laisram N. CTEV Deformity in Down Syndrome: A Rare Combination.Gal Int J Health Sci Res. 2020;5(2):121-123.

Biography

Sucheta Saha has completed her MBBS in the year 2007. She has done Diploma in Medical Radiotherapy (DMRT) in 2009 and MD in Physical Medicine & Rehabilitation) in 2015. She secured Gold Medal for standing first in MD in Guru Govind Singh Indraprastha University, New Delhi, India. She has also received the prestigious 'Indian Association of Physical Medicine & Rehabilitation Gold Medal' for best research paper in 2014. She has undergone observership in Palliative care in AIIMS, New Delhi. Currently she is working as a consultant rehabilitation physician in Institute of Neurosciences Kolkata, India. She has many publications in indexed journals, and she has been serving as a reviewer of two reputed journals. She is a part of many ongoing research projects. Recently, she has done Fellowship in Interventional Pain Management and achieved the first position. She has presented her talk in many national & international conferences and webinars.

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