

Stroke Visor: Evolutionary Application of Volumetric Impedance Phase Shift Spectroscopy in Early Detection of Stroke

Divya R¹ and Rajajeyakumar M^{2*}

¹Department of Physiology, Karpagam Faculty of Medical Sciences and Research, Coimbatore, India

²Department of Physiology, Trichy SRM Medical College Hospital and Research Centre, Trichy, 621105, India.

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ABSTRACT

Early and accurate detection is the most critical part in surviving a stroke as it is one of the fastest and lethal neurological events. Within the first 24 h of onset of stroke, the Emergent large-vessel occlusion (ELVO) has to be treated with Endovascular treatment (EVT). VIPS is a non-invasive technology which works on the principle of Bio impedance. It distinguishes the miniscule dissimilarities in the brain; electrical properties in relation with volume changes in the brain. ELVO affects the cerebral hemispheres unequally such variations results in asymmetry of tissue bio impedance pattern which will be recorded by VIPS.

Keywords: Bioimpedance, Emergent large-vessel occlusion, Endovascular treatment, stroke Visor, Volumetric impedance phase shift spectroscopy

INTRODUCTION

Speed saves!

A stroke occurs when blood flow to an area in brain is shut down, resulting in a deficiency of oxygen to brain tissues, which leads to death of neural tissues along with the loss of function of that particular area of Brain. Early and accurate detection is the most critical part in surviving a stroke as it is one of the fastest and lethal neurological events. Within the first 24 h of onset of stroke, the Emergent large-vessel occlusion (ELVO) has to be treated with Endovascular treatment (EVT). For a delay of every one hour, the probabilities of a positive outcome comes down to about 20%. The speed in responding to a stroke is very critical. It takes hours to transport a patient in Ambulance to a hospital which will be followed by the routine protocol such as physical examination and imaging studies. This increases the jeopardy of grave brain injury. Tactlessly, there is no precise, early-stroke detection device in the ambulance or emergency room to shift the patient directly to stroke treatment centres for instantaneous surgical intervention.

VIPS: VOLUMETRIC IMPEDANCE PHASE SHIFT SPECTROSCOPY

VIPS is a non-invasive technology which works on the principle of Bioimpedance. It distinguishes the miniscule

dissimilarities in the brain's electrical properties in relation with volume changes in the brain (**Figure 1**).

Corresponding author: Dr. Rajajeyakumar M, Assistant Professor, Department of Physiology, SRM Medical College Hospital and Research Centre, Trichy, MGR Medical University, Chennai, Tamil Nadu, India, Tel: +09751382650; E-mail: rajakumar60@gmail.com

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Figure 1. VIPS.

Mechanism of action of VIPS

During an episode of stroke, cerebral volume changes. The VIPS device, acknowledged as the Cerebrotech Visor System, is positioned on the patient's head. It transmits low-frequency radio waves from the sides of back of the head to a receiver connected to the visor in the forehead region. This device records the Alterations in the patterns of tissue bioimpedance that occurs as a result of fluid and electrolyte changes while the low frequency radio waves pass through cerebral fluids. The patient might be having a severe stroke, if the device projects even a minute asymmetry in bioimpedance pattern.

ELVO and VIPS

The Emergent large-vessel occlusion (ELVO) produces an ischemic zone in the brain where the arterial blood content is reduced along with the alteration in fluid and electrolyte distribution across the intracellular, extracellular as well as intravascular spaces. As ELVO affects the cerebral hemispheres unequally such variations results in asymmetry of tissue bioimpedance pattern which will be recorded by VIPS.

Features of VIPS

1. The device is simple.
2. Easy to use.
3. Minimal training is required.
4. Reduces the time gap between diagnosis and treatment of stroke.
5. It produces a large amount of bioimpedance data across a wide array of frequencies.
6. Apart from stroke, its machine learning is used to detect explicit brain pathologies like hydrocephalus,

development of cerebral edema, traumatic brain injury [1].

REFERENCES

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