

Category

Best Startup

Product/Solution Name

BrainWatch - Continuous Pupillary Monitoring

Date of Approval

N/A

Indications

Measurements of pupil size and reactivity to light through closed eyes in hospitalized unconscious patients, such as brain injured patients.

Therapeutic Categories

Monitoring of the pupillary light reflex in brain injured patients that are treated in the neuro intensive care units.

Attached Files:

- BrainWatch Tech.mov
- BrainWatch Tech.mov

Background information and need for solution/product

BrainWatch is developing the world's first-of-its-kind pupillary imaging system for brain injured patients. The system examines the pupils automatically and continuously through closed eyes. Brain injured patients in critical care are constantly monitored to detect any changes in their neurological condition. Early detection of neurological deterioration in these patients is a key point for improved outcomes & recovery. Pupillary light reflex examination is an important, non-invasive diagnostic tool for neurological assessment and provides valuable information in the assessment of brain damage. Despite its importance, pupillary assessment is still done manually & intermittently by the nursing staff with a conventional light source. As a result of that, important indications in pupils can be missed, even though immediate medical intervention is critical to patient survival and neurological outcome. BrainWatch vision is to bring Pupillary Monitoring to 21st century standard; assisting the medical staff in improving outcomes for brain injured patients.

Attached Files:

- BW Background The Need.pdf
- BW Background The Need.pdf

History of the development of the solution/product

BrainWatch product started at a University-Hospital bio design project in Israel and from a long-felt required need of a leading neurosurgeon from Hadassah hospital in Jerusalem.

The clinical need was to indicate the pupillary situation in brain-injured patients in real time and detect pupillary changes as soon as they occur. The idea was to take the pupillary assessment, which is one of the most significant and critical clinical indications in brain injured patients, from a manual method

and bring it to modern standards by making it an automatic and continual measurement.

The first development steps of the project were done in a clinical research activity at Hadassah hospital and a technology proof of concept work with the Hebrew University in Jerusalem. A first lab system was built and a test to prove the main technological challenge in the project, of being able to see the pupil through the eyelid, was done and achieved.

A patent for the idea was filed during that time and since then the patent has been granted in the US and Japan and is in process in Europe.

in late 2020 BrainWatch Tech company was established with funding raised from Ehealth Ventures, a HealthTech Venture Capital, and the Israel Innovation Authority (IIA).

During 2021 BrainWatch developed its first prototype system, a full system to be used in a clinical study, that includes a head unit, a bedside monitor, and the SW to support a fully automatic operation of the system in clinical use.

During 2022 the company started the evaluation of the product in a real clinical environment, in a first in human trial with brain injured patients at the neuro ICU department.

The company is currently continuing the clinical trial and is planning to open a second clinical trial center soon.

Clinical use and results are used to further develop the product and the algorithm. The company is currently focusing on continued clinical work, product development, business development and go to market plans.

Following the design and development work, two more patents were filed on the product's design and clinical methods.

Attached Files:

- BW History.pdf
- BW History.pdf

Why this solution/product is innovative, the broad implications for future research, and/or how it will improve the human condition

BrainWatch is building the first autonomous pupillary monitoring system for patients with brain injury. As of today, there is no automatic alternative for frequent, accurate and continual monitoring of PLR in real time. The device is a first-of-its-kind, NEVER before have the pupils been seen when the eyes are closed! The product allows the medical staff to detect changes in a patient's neurological status in real time, taking neuro-assessment to the 21st century. By using BrainWatch, PLR examinations can be carried out automatically, allowing for remote and continual monitoring without direct medical contact.

The system is constructed as a head unit and a bedside monitor, it uses advanced technology of computer vision and AI to continually monitor brain injured patients' pupillary light reflex without opening their eyes.

The optical unit uses sensitive infrared cameras and a unique illumination method to image the pupils through the eyelids. A novel algorithm approach utilizes the analysis of light propagation through tissue and machine learning to detect and track the pupils and measure the size and reactivity.

BrainWatch has a granted patent for the idea and its clinical use and has two additional patents in submission process for the design of the system, the algorithm, and clinical methods.

BrainWatch is a paradigm shifter for monitoring patients' neurological state. The system is the first automatic monitoring system that can provide periodical and real time insights from the pupillary reactions. The value proposition of BrainWatch, compared to current standard practices, is revolutionizing, BrainWatch is the first wearable monitoring device for PLR examination in neurological patients in critical care and can benefit healthcare providers to reallocate resources at the benefit of the hospital, patients, and their families.

The solution has the potential to integrate with other patient monitoring modalities in neurocritical care and help to improve the understanding of the patient's condition and benefit patient's outcomes. Furthermore, pupillary information and the ability to view the pupils with eyes closed can be useful for other clinical indications and use cases. The system has the potential to be used in cases such as monitoring of pain and sedation levels during surgeries or monitoring and research of patients with sleep problems.

Attached Files:

- BW System.pdf
- BW System.pdf

Please provide appropriate references (ie Pubmed links)

US Patent WO 2017/216800 A1 -

DEVICE AND METHOD FOR DETERMINATION OF PUPIL SIZE IN A SUBJECT HAVING CLOSED EYELIDS

Attached Files:

- Measuring pupil size and light response through closed eyelids.pdf
- Patent WO2017216800A1.pdf
- Patent WO2017216800A1.pdf