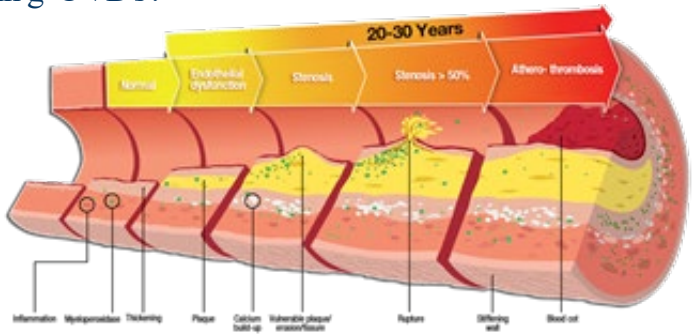
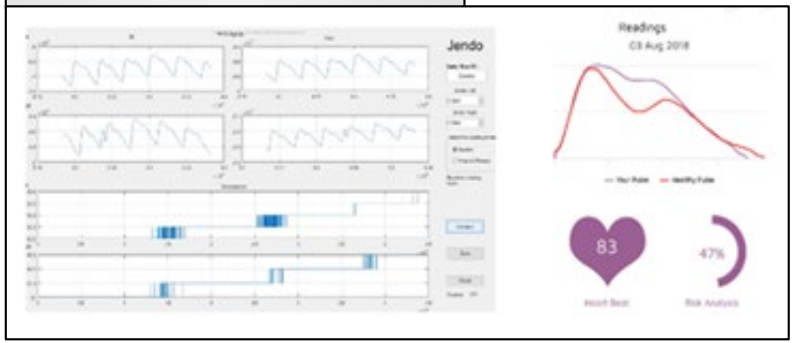
JENDO

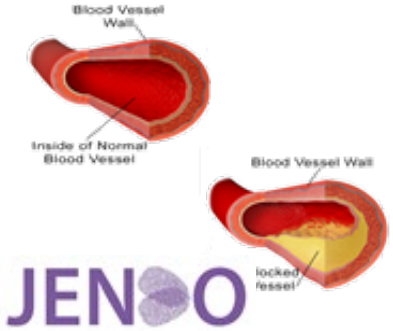
A NOVEL, NON-INVASIVE TECHNOLOGY FOR EARLY DETECTION OF CARDIOVASCULAR DISEASES

INNOVATION 1 : Vascular System Health Test

JENDO is system and method for monitoring vascular system health. It analyses innermost cell layer conditions of the blood vessels to detect endothelial dysfunction and outputs a report with the current condition and the future risk of having CVDs.







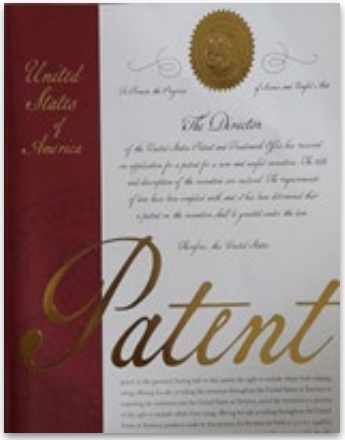
PATENT RIGHTS

Novel method of detecting vascular dysfunction. Earliest indicator of CVD

Non invasive proprietary technology that has tested in the clinical environment

Novelty of the technology was accredited by the USA and Japan patent office

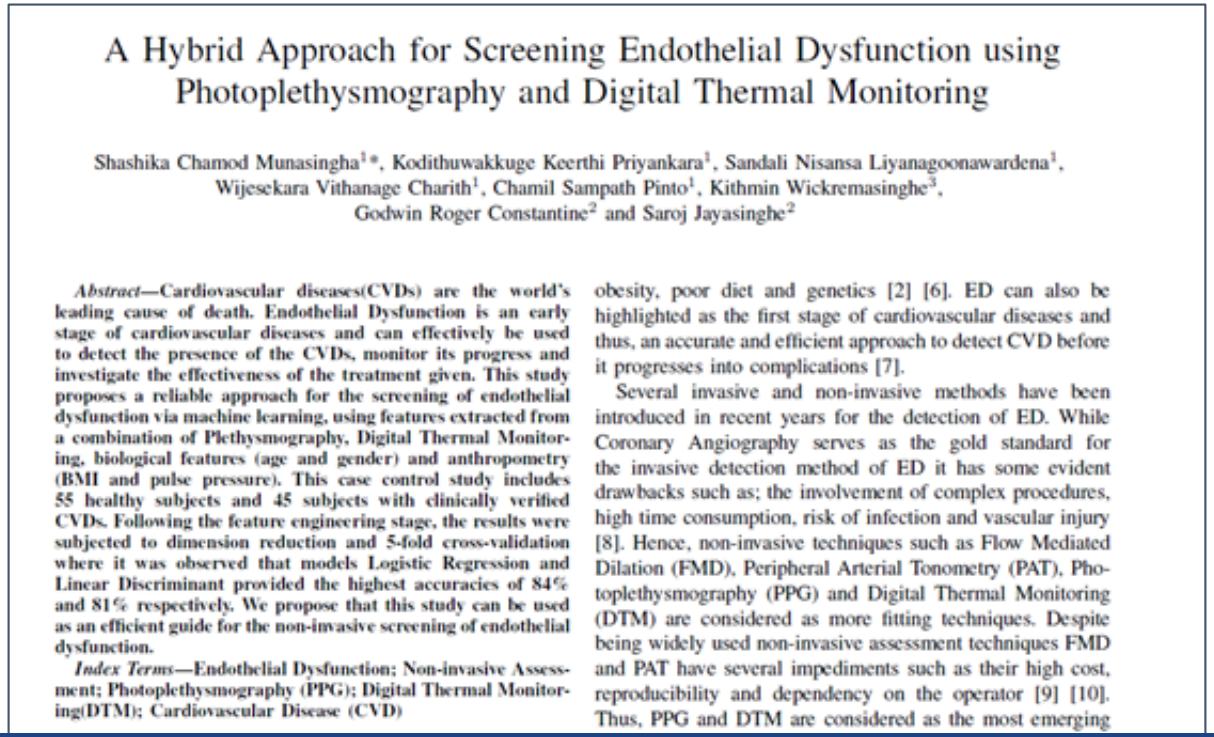
Japan Patent
P7045084



USA Patent
US 10,912,464 B2

PUBLICATION

Annual International Conference of the IEEE EMBC (Engineering in Medicine and Biology Society)
Link - https://ieeexplore.ieee.org/document/on using Photoplethysmography and Digital Thermal Monitoring | IEEE Conference Publication | IEEE Xplore



A Hybrid Approach for Screening Endothelial Dysfunction using Photoplethysmography and Digital Thermal Monitoring

Shashika Chamod Munasingha[1]*, Kodithuwakkuge Keerthi Priyankara[1], Sandali Nisansa Liyanagoonawardena[1], Wijesekara Vithanage Charith[1], Chamil Sampath Pinto[1], Kithmin Wickremasinghe[3], Godwin Roger Constantine[2] and Saroj Jayasinghe[2]

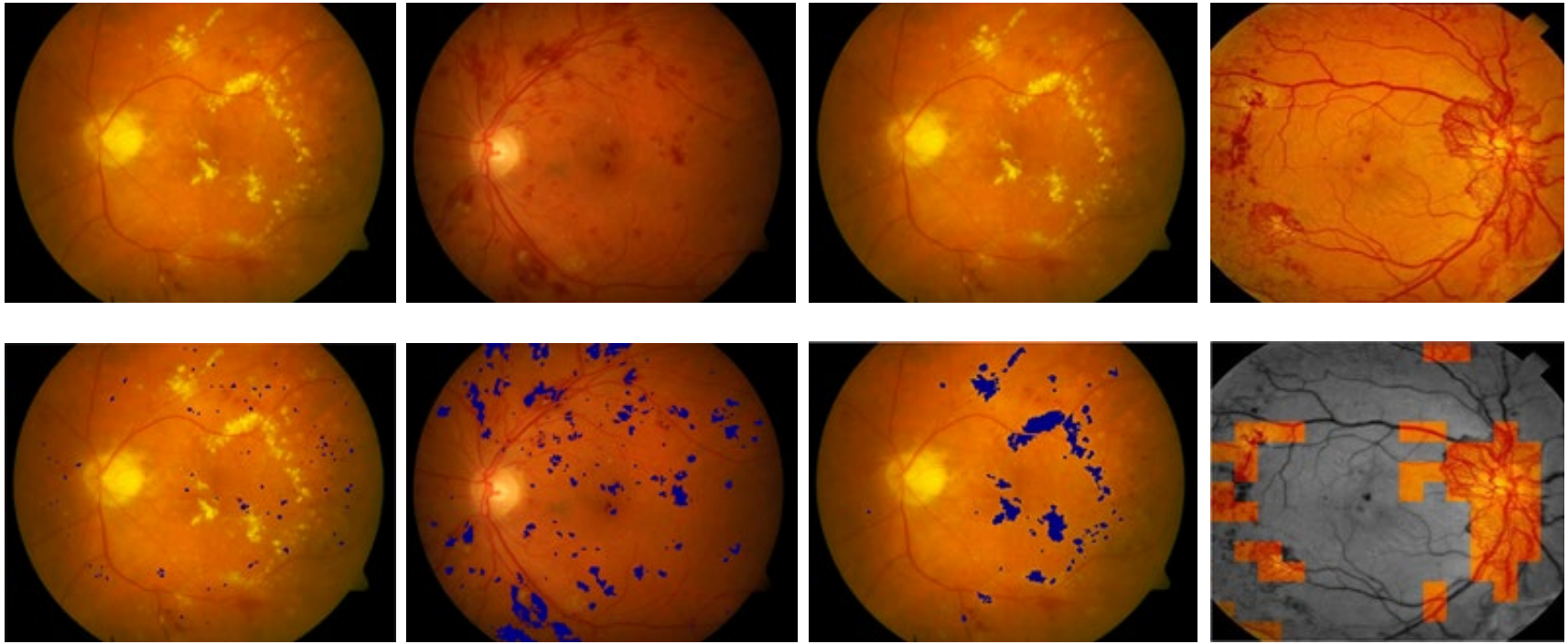
***Abstract*—Cardiovascular diseases(CVDs) are the world's leading cause of death. Endothelial Dysfunction is an early stage of cardiovascular diseases and can effectively be used to detect the presence of the CVDs, monitor its progress and investigate the effectiveness of the treatment given. This study proposes a reliable approach for the screening of endothelial dysfunction via machine learning, using features extracted from a combination of Plethysmography, Digital Thermal Monitoring, biological features (age and gender) and anthropometry (BMI and pulse pressure). This case control study includes 55 healthy subjects and 45 subjects with clinically verified CVDs. Following the feature engineering stage, the results were subjected to dimension reduction and 5-fold cross-validation where it was observed that models Logistic Regression and Linear Discriminant provided the highest accuracies of 84% and 81% respectively. We propose that this study can be used as an efficient guide for the non-invasive screening of endothelial dysfunction.**

***Index Terms*—Endothelial Dysfunction; Non-invasive Assessment; Photoplethysmography (PPG); Digital Thermal Monitoring(DTM); Cardiovascular Disease (CVD)**

obesity, poor diet and genetics [2] [6]. ED can also be highlighted as the first stage of cardiovascular diseases and thus, an accurate and efficient approach to detect CVD before it progresses into complications [7].

Several invasive and non-invasive methods have been introduced in recent years for the detection of ED. While Coronary Angiography serves as the gold standard for the invasive detection method of ED it has some evident drawbacks such as; the involvement of complex procedures, high time consumption, risk of infection and vascular injury [8]. Hence, non-invasive techniques such as Flow Mediated Dilation (FMD), Peripheral Arterial Tonometry (PAT), Photoplethysmography (PPG) and Digital Thermal Monitoring (DTM) are considered as more fitting techniques. Despite being widely used non-invasive assessment techniques FMD and PAT have several impediments such as their high cost, reproducibility and dependency on the operator [9] [10]. Thus, PPG and DTM are considered as the most emerging

INNOVATION 2 : Diabetic Retinopathy Screening



Microaneurysms | Hemorrhages | Exudates | Neovascularization

ETHICS APPROVALS- CLINICAL TRIALS

Ethics Review Committee
Faculty of Medicine
University of Colombo
P O Box 271, Kynsey Road, Colombo 8, Sri Lanka
Telephone: +94-11-2695300 ext 240 Fax: +94-11-2691581
Email: ethicscommitteemfc@gmail.com

REFERENCE: EC-18-102

21st February 2019.

Mr. Keerthi Priyankara
Jendo Innovations (Pvt.) Ltd.
No 7/B/2, Church Road, Wewala,
Piliyandala.

Dear Mr. Priyankara,

RE : **Protocol EC-18-102**

Title : **The Study of Vascular Dysfunction and its Correlates Using a Non-invasive Device**

Investigators : **Mr.Keerthi Priyankara**
Prof. G.R.Constantine
Prof. Upul Senarath
Prof. Saroj Jayasinghe
Dr.Champika Gamakaranage
Mr.Shashika Chamod

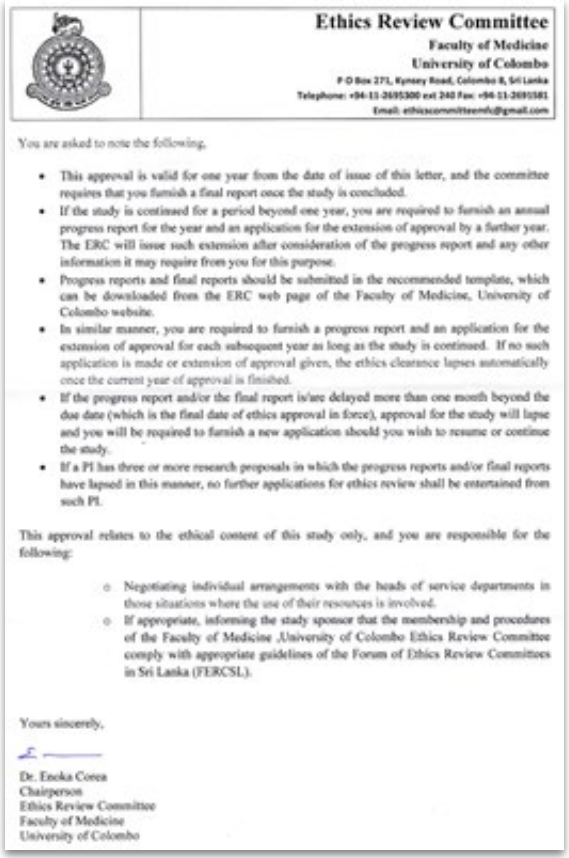
Thank you for submitting the above research proposal, which was considered by the Ethics Review Committee, at its meeting on 21.02.2019. Approval is granted to proceed.

This approval relates to the following:

- Research Proposal (Version 3.1)
- Information sheets (Version 3.1)
- Consent forms (Version 1.0)
- Data collection form (Version 1.0)

The following members of the ERC were present at the meeting:

Dr. Enoka Corea, Dr. Nilakshi Samaranayake, Dr. Sriyakanthi Beneragama, Dr. Dinithi Fernando, , Prof. Ariaranee Gnanathasan, , , Dr. Nauzima Kamardeen, , Dr. Chandani Liyanage, Dr. Nishani Lucas, Dr. Kamal Perera, , Dr.Gayani Ranaweera,Dr. Dulani Samaranayake, Dr. S. Sivagnesh, Dr. Sepalika Welikala & Mrs. Nirmali Wickremesinghe



Ethics Review Committee
Faculty of Medicine
University of Colombo
P O Box 271, Kynsey Road, Colombo 8, Sri Lanka
Telephone: +94-11-2695300 ext 240 Fax: +94-11-2691581
Email: ethicscommitteemfc@gmail.com

You are asked to note the following,

- This approval is valid for one year from the date of issue of this letter, and the committee requires that you furnish a final report once the study is concluded.
- If the study is continued for a period beyond one year, you are required to furnish an annual progress report for the year and an application for the extension of approval by a further year. The ERC will issue such extension after consideration of the progress report and any other information it may require from you for this purpose.
- Progress reports and final reports should be submitted in the recommended template, which can be downloaded from the ERC web page of the Faculty of Medicine, University of Colombo website.
- In similar manner, you are required to furnish a progress report and an application for the extension of approval for each subsequent year as long as the study is continued. If no such application is made or extension of approval given, the ethics clearance lapses automatically once the current year of approval is finished.
- If the progress report and/or the final report is/are delayed more than one month beyond the due date (which is the final date of ethics approval in force), approval for the study will lapse and you will be required to furnish a new application should you wish to resume or continue the study.
- If a PI has three or more research proposals in which the progress reports and/or final reports have lapsed in this manner, no further applications for ethics review shall be entertained from such PI.

This approval relates to the ethical content of this study only, and you are responsible for the following:

- Negotiating individual arrangements with the heads of service departments in those situations where the use of their resources is involved.
- If appropriate, informing the study sponsor that the membership and procedures of the Faculty of Medicine ,University of Colombo Ethics Review Committee comply with appropriate guidelines of the Forum of Ethics Review Committees in Sri Lanka (FERCSL).

Yours sincerely,

Dr. Enoka Corea
Chairperson
Ethics Review Committee
Faculty of Medicine
University of Colombo

Faculty of Medicine
University of Colombo

Ethics approval was obtained from University of Colombo Medical Faculty
Ref: Ec 18- 102

IP COMMERCIALISATION

- Concept Validation
- National Level Evaluations
- IP Rights
- Fund Raising
- Clinical Trials
- Research Publication
- Commercial Trials
- Regulatory Approvals
- Commercial Sales