



Lead American University of Beirut Inventor

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Background and Unmet Need

Skin cancer is one of the most common forms of cancer worldwide, affecting millions of people each year. It represents a significant global health issue, with its high prevalence, substantial economic costs, and serious health implications. In the United States alone, an estimated 1 in 5 Americans will develop skin cancer by the age of 70;¹ approximately 9,500 people in the US are diagnosed with skin cancer every day.² The cost of treating skin cancer in the US exceeds \$8 billion of dollars annually.³

When detected early, the 5-year skin cancer survival rate is 99%.⁴ Early diagnosis of cancer enables treatment that is more effective and less expensive.⁵ The current standard procedure for skin cancer screening includes visual inspections, often leading to the need for invasive biopsies to accurately assess the risk for cancer. Additional imaging methods include CT or MRI scans, which are costly. Further, studies indicate that by 2034, there will be 13,000 fewer dermatologists than are needed to adequately serve the world population.⁶ This shortage underscores the need for non-invasive technologies that streamline preliminary screening and detection to assist practitioners in determining if biopsy or medical intervention is required.

Dr. Costantine's non-invasive platform offers a practical and economic approach to non-invasive skin cancer detection which can be done in an office or clinic setting.

Opportunity

Dr. Costantine and his colleagues have developed a novel non-invasive skin cancer detection sensor to detect and diagnose various forms of skin cancer. The non-invasive device comprises a sensitive electromagnetic sensor, customized radio frequency wave analyzer circuits, and machine learning algorithms. Its sensor design is designed specifically for detecting malignant lesions, supported by multi-feature statistical analysis methods to enhance sensitivity.

This novel technology offers an in-office solution providing screening of skin anomalies in a faster, more efficient manner as compared to current state-of-the-art technologies and methodologies. This tool will support dermatologists or other medical practitioners by providing faster and more direct screening of patients within an office visit setting potentially reducing the need for invasive procedures. Initial proof of concept trials demonstrated the accuracy and efficacy of the device, as well as proved its potential to revolutionize the skin cancer screening and diagnostic market.

The global skin cancer diagnostic market was valued at an estimated \$9.14 billion in 2023 and is expected to grow at a CAGR of 5.52% from 2024 to 2030.⁷ The high prevalence of skin cancer

¹ Skin Cancer Awareness Month: Expert Shares UF Health's Approach to Care, New Advances. University of Florida Health, May 2024.

² Skin Cancer Facts & statistics., Skin Cancer Foundation. N.d.

³ Health and Economic Benefits of Skin Cancer Interventions., Centers for Disease Control and Prevention, May 2024.

⁴ Skin Cancer., Cleveland Clinic, N.d.

⁵ Early cancer diagnosis saves lives, cuts treatment costs. World Health Organization, February 2017.

⁶ 8 Things to Know About the Dermatology Shortage., Health Grades., December 2022.

⁷ Skin Cancer Diagnostics Market Size.... Grand View Research, N.d.

across global populations has created an urgent and strong demand for novel developments to increase availability and to reduce the cost of cancer monitoring and diagnosis. Thus, underscoring the importance of Dr. Costantine's research and the potential impact of the novel non-invasive skin cancer detection sensor.

Unique Attributes

- Non-invasive sensing novel electromagnetic sensor hardware and method.
- Optimized backend circuitry to enable signal analysis in a compact platform without impacting device performance.
- Plurality of algorithms to provide diagnostic decisions based on collected data.
- Utility in both In-Vivo and Ex-Vivo settings.

Clinical Applications

A sensor device to be used in a clinical setting for the screening of malignant skin cancer tumors, including basal cell carcinoma and melanoma.

Stage of Development

Proof of concept and functional prototype.

Intellectual Property

- US Patent No. US 11,923,880 B2 Issued March, 2024.
- International Applications: CA3211958A1 published December 2022; EP4297640A1 published January 2024; and CN117279565A published December 2023.

Collaboration Opportunity

Seeking licensee for commercialization or collaboration to advance clinical development.

References and Publications

Shafi N, Costantine J, Kanj R, Tawk Y, Ramadan AH, Kurban M, Rahal JA, Eid AA. A Portable Non-Invasive Electromagnetic Lesion-Optimized Sensing Device for the Diagnosis of Skin Cancer (SkanMD). IEEE Trans Biomed Circuits Syst. 2023 Jun;17(3):558-573. doi: 10.1109/TBCAS.2023.3260581. Epub 2023 Jul 12. PMID: 37030747.

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