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A Modernized Screening Technology for Cancer Non-Invasive Biodiversified Biosensors

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Abstract

By placing a soft, sensitive device on the skin, you may be able to quickly detect non-invasive skin disorders in real time. A research team led by a scientist from California South University (CSU) has designed a simple electromechanical device that can be used to automatically and non-invasively diagnose deep tissue pathology such as psoriasis. These findings form the basis for future applications in the clinical evaluation of skin cancers or skin diseases.

Keywords: Cancer; Cells; Tissues, Tumors; Prevention, Prognosis; Diagnosis; Imaging; Screening; Treatment; Management

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Introduction

To solve this problem, the research team designed a simple, miniature electromechanical device to accurately and in real time evaluate the hardness of deep tissue. The team used a miniature electromagnetic system that integrates a vibrating actuator and a pressure-sensitive plate for real-time control of the Young module, i.e. tensile stiffness, skin and other biological soft tissues at a depth of approximately 1 to 8 mm. Depends on the sensor design. The team evaluated the device's performance with a range of synthetic and biological materials such as hydrogels, pig skin and in various parts of human skin. The lesions showed higher firmness than the adjacent skin lesions, mainly due to differences in skin elasticity and hydration. These simple measurements have potential clinical significance in the rapid identification and targeting of skin lesions, with capabilities complementing recently reported methods for mechanical measurement. Cancer tissue is typically harder or softer than normal tissue, and this difference could be used as a diagnostic biomarker for a wide range of skin conditions,

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such as skin cancer or subcutaneous tumors [1-510].

Results and Discussion

The thickness of the electromechanical device is only about 2.5 mm and the contact surface is about 2 cm2. This procedure works on both excess hair and hairless areas. Its working mechanism is based on an integrated skin touch interface for virtual / augmented reality developed by Dr. Yu et al. At Northwestern University. The device operates in such a way that the magnet vibrates after applying alternating current through the copper coil and puts pressure on the lower surface of the sensor, which causes deformation in the depth of tissue at the millimeter scale, which leads to changes in resistance periods. It becomes electric. Analysis of these responses by simultaneously measuring the voltage makes it possible to quantify the stiffness of the tissues. Each measurement can be done in one minute. The team then conducted clinical trials on patients with skin disorders with their invented electromechanical device. The results showed that there is a potential for accurate targeting of psoriasis-related lesions, indicating the medical application of the device. The data generated can help diagnose, treat, and monitor the disease, especially for skin-related disorders such as skin cancer, as well as skin aesthetics and healing of superficial wounds.

Conclusions

Electromechanical systems that enable accurate and rapid measurements of the soft tissues of the human body can provide useful clinical information for monitoring, diagnosing, and treating various pathologies, especially skin lesions. However, existing diagnostic evaluations, such as elastography, are available. With magnetic resonance, it usually involves huge instruments in hospitals and trained physicians, and the latest measurement-based tissue stiffness measurement technology can only measure the surface depth of the upper skin up to the micrometer scale.

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Authors' Brief Biographies

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