Handheld Device Can Detect Melanoma

Melanoma is the fifth most common cancer in the US. Approximately 76,690 men and women were diagnosed with it in 2013. While only 5 percent of all skin cancers are due to melanoma, it is the primary cause of 7 percent of deaths related to skin cancer. Moreover, the incidence of melanoma is increasing at a much faster rate than any other cancer, providing a need to accurately diagnose and treat melanoma tumour.

While melanoma tumours may be easy to access since they are typically found on the skin, sometimes it becomes a challenge to measure how deep they are. The thickness of melanoma is an important parameter for determining treatment and prognosis. The chances of metastatic disease and disease mortality are both related to the thickness of the tumour.

Over the years, non-invasive imaging techniques have been developed for melanoma diagnosis. These include optical methods such as dermoscopy, total-body photography, optical coherence tomography, scanning confocal microscopy and two-photon microscopy. However, none of these techniques have the sufficient penetration needed to determine melanoma depth. Most of these methods are not entirely effective since light does not penetrate these tumours very well. Ultrasound does not produce enough contrast to enable physicians to see the tumours against healthy tissue. MRI and PET scans are expensive and have their own limitations.

Photoacoustic microscopy (PAM) may be a more viable alternative in detecting skin vasculatures with high contract and deep penetration. A new handheld photoacoustic detector developed by researchers at Washington University in St. Louis may be able to measure melanoma tumour depth. This device utilises the photoacoustic effect to visualise the tumour from the surface of the skin. When the device is positioned over the tumour, a laser beam is activated to shine light right onto and around it.

The energy from the laser is absorbed by the tumour resulting in a vibration that correlates to the amount of melanin present. Melanoma tumours produce more melanin compared to healthy skin and thus this signal can effectively identity the shape and volume of the tumour.

The study, published in Optic Letters, tested the device in in nude mice in vivo. The researchers imaged mice with melanoma to show the in vivo detection ability of the handheld PAM system. Melanoma B16 cells were subcutaneously injected into the mouse on the dorsal side. The study showed that a melanoma with 3.66 mm thickness was imaged by the system. Both the top and bottom boundaries of the tumour and the skin surface could be effectively seen. Overall, the study showed that melanomas with 4.1 and 3.7 mm thickness were detected in both in phantom and in vivo experiments. It was shown that the imaging ability and the handheld design of this device can prove to be beneficial in the diagnosis, prognosis and surgical planning for clinical melanoma.

Source: Opticsinfobase.org
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