

The significance of high frequency ultrasound and informative technology for diagnosis of the malignant skin tumours / SkinTechSoft

the objective of the project

To develop a non-invasive ultrasonic method and prototype of the automated assessment and imaging software for early stage diagnosis of melanoma and basal cell carcinoma.

motivation

Early stage diagnosis of skin tumours is very important for patient survival. Survival prognosis of a patient with malignant melanoma (MM) is directly dependent on the penetration depth of the tumour. The probability of five-year survival when MM is diagnosed at early stage (thickness \leq 1 mm) is 85–97 % and in the case when the tumour exceeds 4 mm, the probability is only 14–50 %. The non-invasive diagnosis helps to avoid unnecessary excisions, which is required for histological procedure of skin tumours. Moreover, non-invasively determination of tumour thickness is crucial in the surgical planning, since it can help to avoid incomplete excision and re-intervention.

However, diagnostic accuracy of the MM is mainly dependent on the experience of dermatologist.

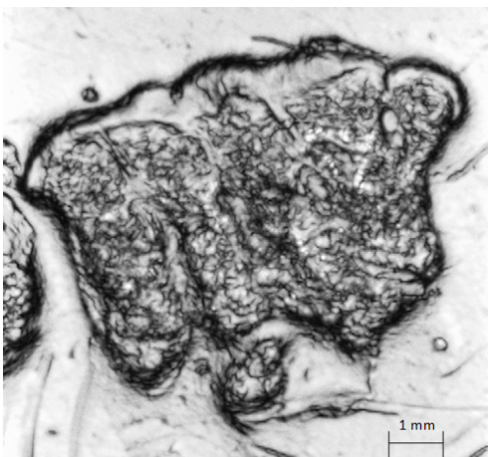
ultrasound institute

Developed non-invasive method for segmentation and automated thickness measurement of thin tumours. The method is based on time-frequency analysis of the ultrasonic radio-frequency signals and suitable to reconstruct the spatial dimensions of lesions;

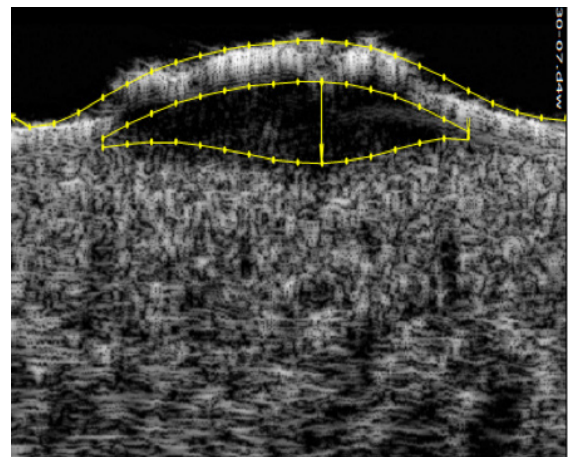
performed quantitative analysis and characterization of skin microstructure changes, the achieved accuracy of malignant melanoma differentiation from benign melanocytic lesions is 84.38%, the sensitivity and specificity of 81.25% and 87.5% respectively;

developed software prototype of the automatic thickness evaluation and ultrasonic imaging of melanoma and basal cell carcinoma;

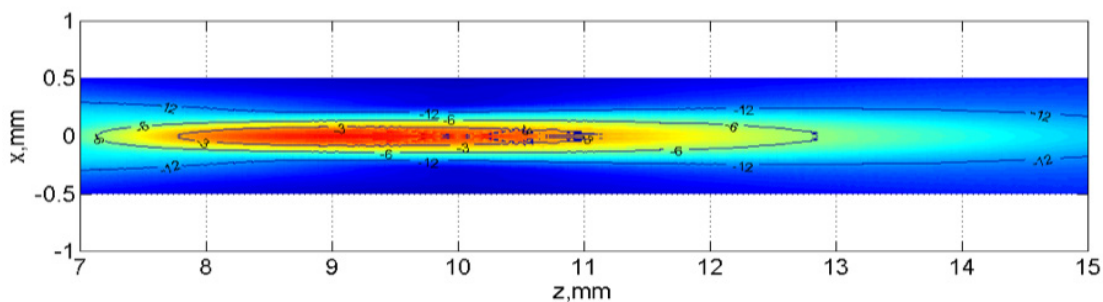
performed ex vivo investigations of the cross-sections of the skin tumours using high frequency (up to 230 MHz) ultrasonic microscope KSI-V8.



Ultrasound C-scan image of the cross-section of the skin tumour sample (ex vivo), 230 MHz



Ultrasound B-scan image of skin melanoma with automatically detected boundaries, 22MHz



Simulated excited field of focused ultrasonic transducer, 22 MHz

project partners

Department of Skin and Venereal Diseases (Lithuanian University of Health Sciences, Lithuania).