High-Frequency Ultrasound of a Patient with Pressure Ulcers

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Summary

Pressure ulcers represent a major problem for individuals as well as for society. Also, pressure ulcers reduce quality of life for many patients. The cost of pressure ulcer treatment is substantial at a worldwide level and is estimated to be approximately $2,000 to $30,000 per case (1). The incidence of pressure ulcers varies in different surveys and is found to be 4.0% among patients admitted to a British hospital (2) and 12.8% among patients admitted to care facilities in three cities in USA (3). Hence, there is a strong need for research related to the patogenesis of pressure ulcers, and to their early detection with the purpose of early intervention.

We have performed high-frequency (20 MHz) ultrasound scanning of a patient with several pressure ulcers to obtain cross-sectional images of ulcers and the surrounding skin. The purpose of the examination was to evaluate whether this method could be used for diagnosis of pressure ulcers and studies of the pathogenesis of the ulcers. The high-frequency ultrasound scanner used was developed for dermatological applications, and subtle details of the dermis and the subcutaneous space can be imaged using the scanner (4). We found a prominent sub-epidermal echolucent band over the ulcers and the perilesional skin, becoming wider the more advanced the pressure ulcers were.

Case Report

The patient was an 88-year-old paraplegic man presented with multiple pressure ulcers in the lumbo-sacral, trochanter region and in both feet. In May 2005, we used a 20 Mhz B-mode scanner (Cortex Technology, Denmark) to obtain cross-sectional images of the ulcers and the surrounding skin. The ulcers were in stages I–III (NPUAP definition for staging) (1).

The most characteristic change in the dermis was a prominent sub-epidermal echolucent band observed over stage I-III ulcers and in the perilesional skin of manifest ulcers. The band became wider and more distinct for more advanced ulcer grades and close to the ulcer margin. The reticular dermis was less affected. The subcutaneous space showed minor change. Fig. 1A is a scan of a stage 1 ulcer on the hip showing a minor sub-epidermal echolucent band. The sub-epidermal band becomes wider on a stage 2 ulcer as seen in Fig. 1B. Fig. 2 shows two combined images obtained along the same line beginning at the border of the ulcer. It is apparent how the sub-epidermal echolucent band becomes dominant near the border of the ulcer.

Discussion

Significant skin changes were found on the scanned images corresponding to the superficial vascular plexus in

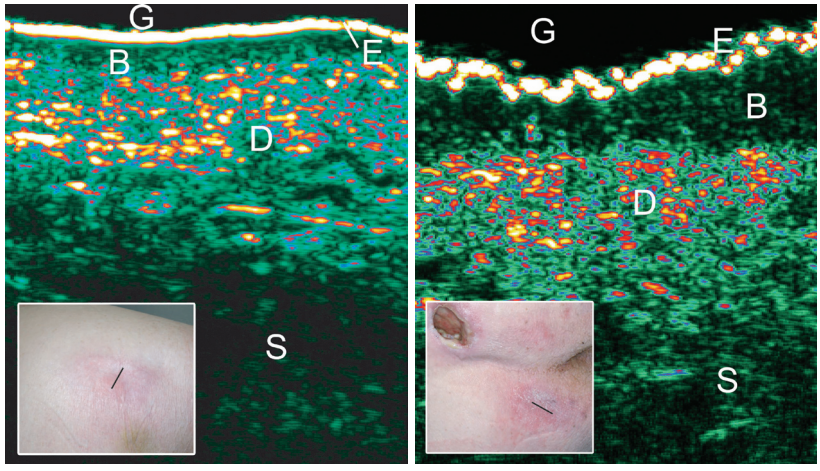

Fig. 1. Minor sub-epidermal echolucent band of stage 1 ulcer on the hip (A) and stage 2 ulcer on the left buttock (B). Insert: Photo of skin showing trace of scan. G: Gel Coupling Medium, B: Sub-epidermal Echolucent Band, E: Epidermis, D: Dermis, S: Subcutis.

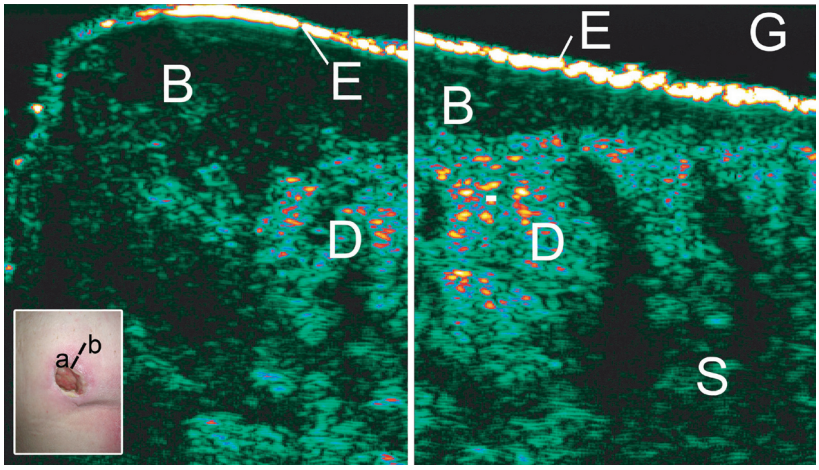

Fig. 2. Prominent sub-epidermal echolucent band at a stage 3 ulcer on the back. Insert: Photo of skin showing trace of scan. a): left scan, b) right scan. Same symbols as in Figure 1.

sub-epidermis. This highly metabolic part of the skin seems important for tissue survival and depends on the dermis–epidermis vascular and diffusional supplies. We suspect that the echolucent band represents damage of the vascular plexus caused by physical pressure and can be a sign of poor nutrition of the outer skin causing ulceration. Thus, it seems that echographic changes can be taken as risk predictors of pressure ulcer in the clinic. Further studies are needed. We will shortly begin a randomized study of 15 patients to widen our study. Erythema index, temperature and elasticity of the skin will also be measured and the results will be compared to those of high-frequency ultrasound scanning.

References

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Conflicts of interest

None declared.