

### Use of electronic tonometer to assess skin hardness in systemic sclerosis: a pilot cross-sectional study

Sirs,

The modified Rodnan skin score (MRSS) is a valid and reliable tool for assessment of skin disease in patients with systemic sclerosis (SSc) but has its own limitations (1, 2, 3). The use of a durometer in recent studies (4, 5) to measure skin hardness and elasticity was found to be a valid and objective tool. This pilot study was undertaken to assess the utility of an electronic tonometer to objectively assess skin hardness in SSc and compare it to MRSS. Tonometer measurements have been reported to be valid and reliable in assessing burn scar elasticity (6, 7) and extremity lymphedema (8, 9).

The principle of a tonometer (Fig. 1) is to measure the deformation produced by a known weight or force, which is recorded on a continuous scale with sensitivity of 0.1mm. Consequently, the values are lower for harder skin and the range of readings can be between 0 and 25 mm. The indentation depth is measured relative to a 60mm diameter reference plate which contacts the tissue surrounding the indentation point. The reference plate is attached to a micro switch, which latches the indentation reading when the reference plate contacts the tissue. The resulting value is displayed on a light emitting diode (LED) display. The indentation depth is detected using an optical detector and associated linear code strip. On the other hand, values are higher for harder skin when measured by a durometer. Skin hardness was measured using a hand-held electronic tonometer with three readings at each of the nine sites (arms, forearms, abdomen, thighs and legs) and then averaged in patients with SSc and controls. MRSS was used to measure skin thickness at 17 sites (scored 0-3 at each).

Ten patients (two males) with diffuse skin disease of variable duration from the South Australian Scleroderma Registry (10) and eight controls (three males) attending the rheumatology clinic in the hospital were studied. Total tonometer scores (TTS) were lower in SSc ( $p=0.0005$ ) compared with controls (mean scores  $50\pm 13.1$  and  $74.3\pm 6.5$  respectively). Duration of SSc and TTS was not correlated ( $p=0.23$ ). However MRSS and TTS had a strong inverse correlation ( $p=0.0001$ ,  $r^2 0.86$ ). The individual site tonometer and skin score also correlated

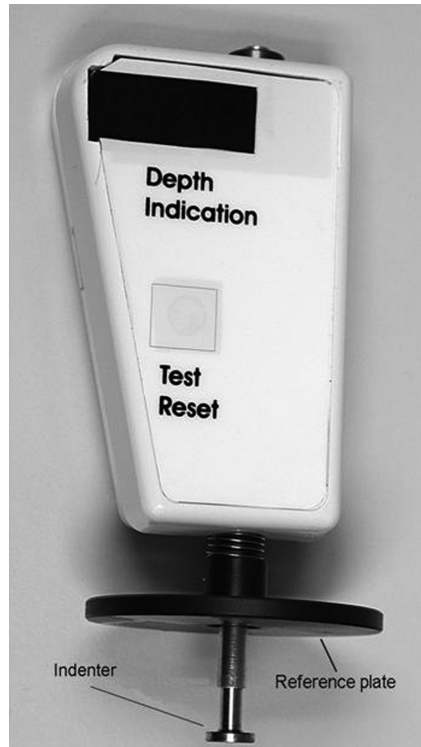


Fig. 1. Electronic tonometer.

inversely ( $p<0.0001$ ,  $r^2 0.49$ ). The intra-operator coefficient of variation (CV) was 7.3% and 7% in one patient and one control respectively. The interoperator CV was 17% and 19% in two patients with SSc.

The electronic tonometer is a novel portable device which provides an easy objective assessment of skin hardness and correlates well with individual site and total MRSS. Tonometry provides a continuous and increased range of measurement values for skin hardness in patients with SSc compared to the categorical skin score; therefore it has the potential to detect minor changes which are not appreciated by MRSS during follow-up of these patients. The limitations of our study include small sample size, selection bias as patients were not randomly selected and cross-sectional study design with no follow-up data. The duration of SSc and TTS did not show any correlation probably secondary to our small numbers. The terms hardness (rigidity and resistance to pressure), thickness (dimension measurable by MRSS), elasticity (ability to return to initial form after deformation) and distensibility (ability to expand) which describe different properties of skin are not measurable by a single instrument.

Until then, we will have to rely on multiple instruments to assess the skin. To our knowledge, this is the first instance an electronic tonometer has been used in SSc to assess skin hardness and it may have utility in detecting small changes in skin hardness over time when newer therapeutic agents are available in future.

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