calculated by averaging the remaining items in case of a maximum of one or three MIs, respectively.

**Rheumatology key message**

- Up to one missing item for BASDAI and three for BASFI can reliably be imputed when assessing patients with AS.

**Acknowledgements**

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**References**


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**Further confirmation that digital ulcers are associated with the severity of abnormality on nailfold capillaroscopy in patients with systemic sclerosis**

Sir, In a recent pilot study in a cohort of patients with SSc, Smith et al. [1] demonstrated an association between nailfold videocapillaroscopy (NVC) patterns and the severity of peripheral vascular involvement, as assessed after 18–24 months. These findings lend further support to the proposal that the severity of abnormality on NVC may serve as a useful biomarker for the prediction of digital ulceration in SSc [2, 3]. As part of a prospective, single-centre study examining the prevalence of SSc-related digital ulcers (DUs) [4], we used quantitative NVC to assess whether microvascular abnormalities were associated with the presence of current DUs. The North West Greater Manchester National Research Ethics Service Committee approved the study.

As previously reported [4], patients attending specialist SSc clinics between January and December 2009 were invited to participate and, following informed consent, each was assessed by a specialist nurse who documented the presence or absence of active DUs. An active DU was defined as a distinct lesion with loss of epidermis. Data on point prevalence and physical function are reported elsewhere [4]. Following acclimatization in a temperature-controlled laboratory, patients underwent quantitative NVC of the non-dominant ring finger as previously described [5]. In brief, panoramic, high-magnification (300×) images of the distal nailfold capillary row were acquired. A vascular technician manually marked up the
capillary apices. Customized software was then used to calculate automated measures of intercapillary distance, capillary width, tortuosity (defined as the amount of change in the direction of an individual capillary’s direction, or how ‘curly’ it is) and derangement (defined as the variance in the direction of all the capillaries marked up). All measurements were made in arbitrary units. In addition to these semi-automated measurements, the initial apex mark-up was used as a direct measure of capillaries per millimetre. Unifactorial logistic regression was applied to assess association with ulcer status of capillaroscopy scores. Analyses were performed using Stata statistical software (version 10; StataCorp, College Station, TX, USA).

NVC data were available for 121 of the 148 patients who participated in the study [10 with ulcers and 111 without, 104 (86%) female, median age 60 years (range 21–88), median RP duration 18 years (range 4–69), median disease duration 12 years (range 3–54)] and are shown in Table 1. NVC data for the remaining 27 patients were unavailable for one of the following reasons: results being uninterpretable (i.e. capillaries not clearly visualized), or the patient did not undergo capillaroscopy due to the presence of contracture or due to time constraints in the clinic. For the semi-automated measurements, intercapillary distance was greater in patients with active ulcers [log (intercapillary distance), \( P = 0.03 \)]. Consistent with this, capillary density was lower, although not significantly (\( P = 0.09 \)), in patients with DUs. Capillary width, tortuosity and derangement were not significantly different in patients with or without ulcers (\( P = 0.96, P = 0.97 \) and \( P = 0.54 \), respectively).

The finding that intercapillary distance was greater in those with current DUs is further evidence that patients with the most marked microvascular abnormalities (as assessed by NVC) are most likely to develop DUs, and lends further support for NVC as a clinical biomarker in patients with SSc.

### Table 1 Nailfold capillaroscopic parameters in 121 patients with SSc

<table>
<thead>
<tr>
<th>Capillaroscopy, semi-automated measurements</th>
<th>No digital ulcers, median (range) (n = 111)</th>
<th>Digital ulcers, median (range) (n = 10)</th>
<th>Mean difference (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercapillary distance (arbitrary units)</td>
<td>26 914 (19 998–45 927)</td>
<td>49 923 (38 755–63 221)</td>
<td>1.60 (1.04, 2.46)</td>
<td>0.03</td>
</tr>
<tr>
<td>Capillary width (arbitrary units)</td>
<td>15.0 (12.0–17.4)</td>
<td>14.3 (12.6–16.3)</td>
<td>−0.1 (−2.5, 2.4)</td>
<td>0.96</td>
</tr>
<tr>
<td>Derangement (arbitrary units)</td>
<td>11.9 (8.8–14.9)</td>
<td>13.5 (8.6–14.3)</td>
<td>0.1 (−3.2, 3.3)</td>
<td>0.97</td>
</tr>
<tr>
<td>Tortuosity (arbitrary units), manual</td>
<td>3.31 (3.23–3.37)</td>
<td>3.31 (3.20–3.42)</td>
<td>−0.03 (−0.11, 0.06)</td>
<td>0.54</td>
</tr>
<tr>
<td>Measurement, number/mm</td>
<td>4.9 (3.5–7.2)</td>
<td>3.3 (3.0–4.4)</td>
<td>−1.4 (−3.0, 0.2)</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*Analysed on a log scale, so difference and CI are a multiplying factor between geometric mean values of the two groups.*

**Rheumatology key message**

- SSc-related digital ulcers are associated with increased intercapillary distance.

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**References**


