Nailfold capillaroscopy in systemic sclerosis: How many fingers should be examined to detect abnormality?

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Introduction

- Nailfold capillaroscopy plays an important role in diagnosing systemic sclerosis (SSc), with abnormal nailfold capillary appearance (Figure 1) being included in the 2013 ACR/EULAR diagnostic criteria [1].
- Common queries from clinicians who assess patients with suspected SSc are:
    1) which finger(s) should be imaged?
    2) how many digits in total should be imaged?

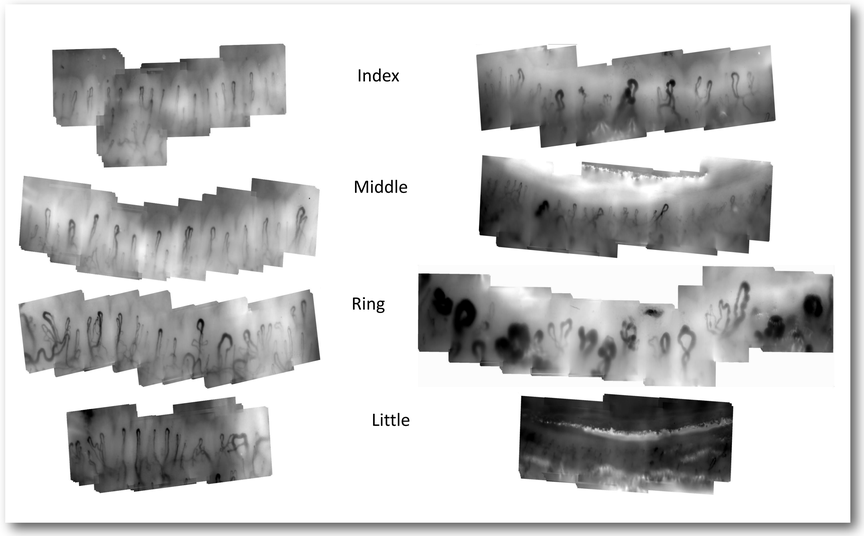

Figure 1. Nailfold capillaroscopy mosaics from two patients with SSc, demonstrating potential for variation in appearance between fingers in both overall image grade and presence of giant vessels. Imaged digits are (from top to bottom) index, middle, ring and little finger.

Objectives

To demonstrate the sensitivity of assessing different (combinations of) fingers for the presence of two markers of capillary abnormality: (1) presence of giant capillaries, and (2) overall image grade, compared to assessment of all 8 fingers.

Method

- High-magnification (300x) nailfold videocapillaroscopy mosaic images were captured using a microscope system from KK Technology (Honiton, UK).
- Nailfold images (all fingers from each of 101 patients with SSc) and subsequent multi-observer assessments from a large study of quantitative capillaroscopy [2] were characterised by digit.
- Observers assessed images using custom software (Figure 2), including (for this analysis) counting giant vessels and grading the image overall (including normal/early/active/late, as well as non-specific and ungradeable).

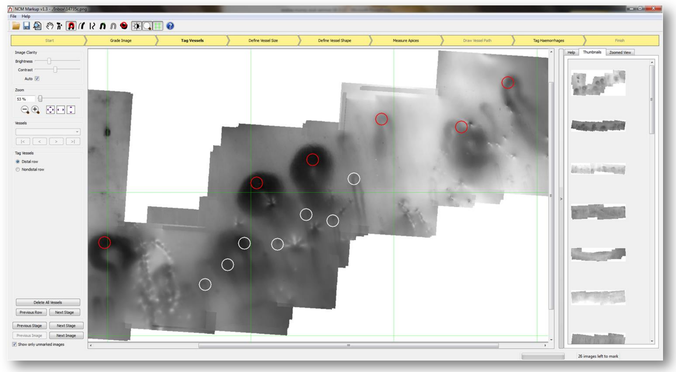

Figure 2. Capillaroscopy image mark-up software interface. Vessels are marked by clicking at their apex (red circles: distal vessels, white circles: non-distal vessels). Image measurement tools are on the left, a queue of images to be marked is on the right.

- Patients were defined as "true case" for each of 2 parameters (giants, and image grade) if at least one of 8 fingers tested positive for the parameter (i.e. ≥ 1 giant vessels in one or more fingers, or one or more fingers given an 'abnormal' [early/active/late] grade).
- Seven single-finger, or finger combinations (derived from the middle and ring fingers), were then tested for sensitivity of achieving the correct result against the 8-finger "gold standard" true cases.

Results

- For each of seven combinations of finger(s), Table 1 shows the sensitivity percentages for the two parameters.
- For the 8-finger "gold standard", sensitivity against the diagnostic criteria was 53.0% (71 positive cases from 134 assessments) and 73.1% (98 positive cases from 134 assessments) for presence of giants and image grade, respectively.
- Pairs of fingers have higher sensitivity than single fingers in all cases, and the 4-finger combination shows a sensitivity of 85.9% and 91.8% for giants and image grade, respectively.

	Presence of giant capillaries (71 assessments from 42 patients)		Abnormal image grade (98 assessments from 58 patients)	
Finger(s)	Frequency	(%)	Frequency	(%)
Ring Left	40	56.3	63	64.3
Ring Right	32	45.1	58	59.2
Either Ring	52	73.2	79	80.6
Middle Left	32	45.1	55	56.1
Middle Right	23	32.4	44	44.9
Either Middle	40	56.3	72	73.5
Any Middle or Ring	61	85.9	90	91.8

Table 1. Sensitivity values for two nailfold capillary parameters (presence of giants, and image grade).

Conclusion

- Assessing only middle and ring fingers on both hands detects abnormality in 85-90% of cases of established SSc (halving imaging time).
- Assessing only ring fingers (sensitivity 73-80%) brings a 75% reduction in imaging time.
- Some cases of abnormality will be missed by not examining all fingers.

[1] Van den Hoogen F, Khanna D, Fransen J, et al. Ann Rheum Dis 2013; 72: 1747-55.

[2] Dinsdale G, Moore T, O'Leary N, et al. Microvascular Res 2017; 112: 1-6.

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