All images are copyright of Salford Royal Hospitals NHS Trust.

The images remain the property of SRHT and cannot be reproduced in any format without permission.
The ‘distal-dorsal difference’: a thermographic parameter by which to differentiate between primary and secondary Raynaud’s phenomenon

1ME Anderson, 1TL Moore, 2M Lunt, 1AL Herrick, University of Manchester: 1Rheumatic Diseases Centre, Hope Hospital, Salford, and 2ARC Epidemiology Unit, Manchester.
Raynaud’s Phenomenon

Primary or secondary?

1. History
2. Examination
3. Investigations
Healthy control subject at 23°C room temperature
Raynaud’s phenomenon patient at 23°C room temperature
Normal Rewarming Curve

Temperature (°C)

Time (min)

Index
Middle
Ring
Little
Secondary Raynaud's Phenomenon
Rewarming Curve

Temperature (°C)

Time (min)

Index  Middle  Ring  Little
Systemic sclerosis patient at 30°C room temperature
Hypothesis

The presence of a temperature difference of $>1^\circ C$ (fingers cooler than dorsum) between the fingertips and dorsum of the same hand (distal-dorsal difference or DDD) at a room temperature of $30^\circ C$ is specific for underlying structural vascular disease [1]

Aim

A. To test this hypothesis and
B. Evaluate all parameters measured during infra-red thermographic testing of patients with RP, in the setting of a tertiary referral centre for RP, in order to ascertain the sensitivity and specificity of thermography in differentiating between patients with PRP and patients with RP secondary to SSc.
Retrospective analysis of case notes and thermography results of patients attending the Hope Hospital vascular lab for thermographic testing: 01/01/98 to 31/12/99
Methods - 2

• Of 161 patients, case notes available on 152 patients

• To expand number of patients in the SSc group, all patients added to the SSc database who had had thermographic testing between 31/12/99 & 10/01/01 (14 SSc patients) were included in analysis
Of 164 patients:-

- 56 PRP
- 45 SSc
- 21 UCTD
- 10 RP secondary to another condition
- 34 unclassifiable
Methods - 4

• Maximum DDD (°C): A) @ 23°C, and B) @ 30°C
• No. of fingers with DDD > 1°C: A) @ 23°C, and B) @ 30°C
• No. of patients with any finger with DDD > 1°C: A) @ 23°C, and B) @ 30°C
• Rewarming lag time (min)
• Maximum rewarming gradient (°C/min)
• Rewarming recovery achieved after 15 min (%)
• Maximum rewarming recovery achieved (%)
### Results - 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>DDD @ 30°C, no. of patients (%)</th>
<th>Rewarm curve gradient, mean (95% CIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP (n=56)</td>
<td>8 (14%)</td>
<td>2.8 (2.3, 3.4)</td>
</tr>
<tr>
<td>SSc (n=45)</td>
<td>31 (69%)</td>
<td>1.1 (0.8, 1.4)</td>
</tr>
<tr>
<td>UCTD (n=21)</td>
<td>5 (24%)</td>
<td>3.2 (2.2, 4.2)</td>
</tr>
</tbody>
</table>
Results - 2

‘Distal-dorsal difference’ (DDD) >1°C at 30°C room temp:-

• 86% specificity
• 69% sensitivity

in identifying the patient with RP secondary to SSc
Results - 3

Using combined logistic regression of all DDD and rewarming curve variables plus age:-

1. DDD $>1^\circ\text{C}$ at 30$^\circ\text{C}$ room temp
2. Older age, and
3. Smaller maximum gradient of rewarming curve

were of greatest value in identifying the patient with RP secondary to SS$\text{c}$. 
Results - 4

Combined linear predictor

![Combined linear predictor plot]

- **Combined linear predictor 1**
  - **Group**
    - PRP
    - SSC
    - UCTD
  - **N**
    - 56
    - 42
    - 19

---

**Combined linear predictor**

- **Group**
  - PRP
  - SSC
  - UCTD

---

**N**

- 56
- 42
- 19
Results - 5

A simple score based on DDD > 1°C at 30°C, age and maximum rewarming curve gradient provided good discrimination between PRP and SSc groups, as evidenced by:

1. Area under ROC curve = 0.888, and
2. 81% sensitivity, 79% specificity for the appropriate score cut-off point.
Conclusions - 1

1. Thermography is a useful investigative tool in assessment of the patient with RP
Conclusions - 2

2. DDD >1°C at 30°C room temp

a) Is specific for underlying structural vascular disease

b) In combination with age of patient studied improves on the ability of the thermographic test to identify the patient with RP secondary to systemic sclerosis