Correlation between patient self-report of symptoms of Raynaud's phenomenon and objective assessment of digital microvascular perfusion using infrared thermography

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Background: Patient self-report of digital colour changes form the basis of a clinical diagnosis of Raynaud's phenomenon (RP) and help classify patients with early systemic sclerosis (SSc). There is a high reported prevalence of RP symptoms in fibromyalgia syndrome (FMS) but little evidence of a true vasculopathy. We report the findings of a retrospective study designed to evaluate the relationship between patient self-report of digital colour changes and objective assessment of digital microvascular function using infra-red thermography (IRT) in patients with primary RP, SSc and FMS.

Methods: Retrospective review of all patients referred for thermographic evaluation between 2010 and 2012 was undertaken. Our thermographic protocol includes the completion of a patient-reported questionnaire documenting symptoms of RP. Thermographic assessment of the resting longitudinal thermal gradient of all fingers was undertaken by calculating the mean distal dorsal difference (DDD) at 23^{o}C. A negative DDD is suggestive of digital microvascular dysfunction and a DDD of -1 ^{o}C or less has previously been reported as clinically relevant. A subsequent case note review was undertaken to select out patients with a clinician diagnosis of primary RP (ANA negative), SSc (sclerodactyly in conjunction with a SSc-specific autoantibody and/or abnormal nail fold capillaroscopy) and FMS (1990 criteria).

Results: 138 patients were evaluated (83 PRP, 12 SSc, 43 FMS). No pattern of digital colour change discriminated between the three groups (Table). In all groups RP symptoms were most frequently monophasic, with white being the most common colour change. In the SSc group, triphasic colour changes were uncommonly reported but thumb involvement was more common than in the other groups (non-significant). Thermographic assessment revealed most pronounced peripheral microvascular dysfunction in SSc followed by primary RP and then FMS respectively. Using the DDD to differentiate between SSc and FMS, area under ROC curve analysis was 0.7 (95% CI, 0.558- 0.842, p 0.036), with an optimal DDD cutoff of -0.76 (66% sensitivity and 65% specificity). Regression analysis did not identify any relationship between thermographic analysis and specific colour changes, pattern of color change or body area affected by RP. After adjusting for vasodilator use and co-morbidities, only current smoking showed an increased risk for a lower DDD (OR 2.9, CI 95% 1.17-7.23, p 0.02).

Conclusion: Patient self-report of RP symptoms are similar across primary RP, SSc and FMS and do not aid disease classification. Objective assessment using IRT revealed strong trends for differences in baseline digital microvascular function across the 3 groups although relatively low patient numbers for SSc hampered data analysis. Despite a similar burden of patient-reported symptoms of RP, normal thermographic appearances were identified in the majority of patients with FMS.

* p=0.09 vs. FMS	**Primary RP (n=83)**	**SSc (n=12)**	**FMS (n=43)**
Age, mean (SD)	47.8 (14.8)	53.1 (13.6)	43.8 (10.8)
Females, n (%)	64 (77.1)	10 (83.3)	39 (90.7)
White, n (%)	58 (69.9)	9 (75)	29 (67.4)
Blue, n (%)	36 (43.4)	7 (58.3)	14 (32.6)
Red, n (%)	35 (42.2)	5 (41.7)	21 (48.8)
Purple, n (%)	39 (47)	3 (25)	16 (37.2)
Monophasic, n (%)	23 (27.7)	5 (41.7)	14 (32.6)
Biphasic, n (%)	21 (25.3)	4 (33.3)	11 (25.6)

Triphasic, n (%)	17 (20.5)	1 (8.3)	8 (18.6)
Numbness, n (%)	71 (85.5)	12 (100)	41 (95.3)
Symptoms in absence of cold, n (%)	45 (54.2)	8 (66.7)	25 (58.1)
Thumbs involvement, n (%)	30 (36.1)	7 (58.3)	17 (39.5)
Toes involvement, n (%)	65 (78.3)	8 (66.7)	35 (81.4)
Average DDD ^{o}C, median (IQR)	-1.05 (4.83)	-2.2 (4.5)	+0.62 (4.92)
Proportion of patients with a mean DDD <-1.0 ^{o}C, n (%)	42 (50.6)	8 (66.7)*	15 (34.9)