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# Capillaroscopy

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Raynaud's phenomenon (RP) is the most common and significant clinical condition with an indication for a microvascular analysis to be carried out as soon as possible. Microvascular involvement is a key feature of RP and several rheumatic diseases are characterised by the presence of RP. Nailfold capillary microscopy shows an impressive cost/effectiveness ratio: it is simple, non-invasive and inexpensive. Well recognised nailfold videocapillaroscopic patterns (NVC) have been described mainly in systemic sclerosis (SSc) patients with secondary RP. The peripheral microvascular damage in SSc is characterised by increasing structural alterations of the capillaries (giant capillaries and microhaemorrhages) with a progressive decrease in their density. The detection of the scleroderma NVC pattern allows an early distinction between the primary RP (functional, not disease associated) and the secondary RP (disease associated). Other major NVC patterns have been described in the field of rheumatic diseases. Interestingly, correlations are evident between the NVC and the clinical symptoms, severity of the disease and the laboratory findings.

**Key words:** capillaroscopy; systemic sclerosis; systemic lupus erythematosus; dermatomyositis; undifferentiated connective tissue disease; videocapillaroscopy; microvasculature.

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## THE HISTORY OF CAPILLAROSCOPY

The history of capillaroscopy started about 200 years ago (for a review, see Cutolo et al<sup>1</sup>). An Italian physician, Giovanni Rasori (1766–1837), described

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the close relationship between conjunctival inflammation and the presence of an 'inextricable knot of capillary loops' visible through a magnifying glass. He also stressed that 'the parts where this phenomenon is developing become abnormally reddish'.

After this description in the mid-19th century, at the beginning of the 20th century Hutchinson was able to differentiate Raynaud's phenomenon (RP) as a primary phenomenon as well as secondary to different diseases. In 1912, Lombard discovered that the periungueal skin capillaries could be observed in humans using a microscope after the application of an oil drop. In 1916, Weiss standardised the capillaroscopic technique and was able to take pictures of the capillaries using a primordial camera. In 1925, Brown and O'Leary used capillaroscopic analysis to show in detail the abnormalities that characterize the involvement of the microvasculature during RP in systemic sclerosis (SSc). Thereafter, Allen and Brown in 1932 and Hunt in 1936, criticised the microvascular interpretation that Raynaud gave to the phenomenon and suggested that a macrovascular component was necessary to generate the profound sufferance of the acral tissue.

After these observations, capillaroscopy was neglected for some decades, but in the second half of the 20th century it was begun again and its utility in the characterisation of RP has then been progressively recognised, in particular, thanks to the seminal work of Hildegard Maricq and Carwile LeRoy. In fact, 30 years ago (1973), these authors published the first paper in *Arthritis and Rheumatism* to describe the specific capillaroscopic patterns in SSc.<sup>2</sup> Moreover, in 1976, these same authors observed the continuous modification of the capillary blood flow during cold exposure in both primary and secondary RP.<sup>3</sup> They observed that the capillary blood flow was completely at a standstill in SSc and was intermittent in primary RP, whilst it was continuous in healthy subjects.

Recently, Cutolo et al reclassified the three defined major nailfold videocapillaroscopic (NVC) patterns that are now considered to be useful in assessing the appearance and progression of sclerodermic microangiopathy.<sup>4</sup> These three patterns include 'early', 'active' and 'late' characteristic pictures.

In summary, direct observation of the microvasculature using capillaroscopy is useful both for an early diagnosis of connective tissue diseases in the presence of RP (i.e. SSc) and for functional studies, in particular using the many technical modifications and implementations achieved in the past century.

## HOW TO PERFORM A CAPILLAROSCOPY

'In vivo' morphological evaluation of skin capillaries is generally performed at the nailfold because that area is easily accessible for examination and here the major axis of the capillaries is parallel to the skin surface, while in other areas it appears to be perpendicular.

Each subject must be kept inside the procedure room for a minimum of 15 minutes before the nailfold analysis can be performed, to adapt to the room temperature of 20–22 °C. The nailfolds of all 10 fingers should be examined in each patient; a drop of immersion oil is placed on the nailfold bed to improve the image resolution. Fingers affected by recent local trauma are not analysed. Preferably, the operator should perform the NVC examination in a blind manner, i.e. without knowledge of the patient's clinical diagnosis and/or disease severity.

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