

Nailfold dermatoscopy in general practice

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Background

Nailfold capillary examination can assist in distinguishing between primary Raynaud's phenomenon and secondary Raynaud's that is associated with a connective tissue disease. Dermatoscopy is a reliable technique in the evaluation of nailfold capillaries and assists in the diagnosis of connective tissue diseases such as scleroderma.

Objective

This article provides an overview of the usefulness of nailfold capillary dermatoscopy in rheumatic and non-rheumatic diseases, and includes the MDAD (morphology, diameter, architecture and density) approach to nailfold dermatoscopy.

Discussion

Dermatoscopes are useful devices in examining nailfold capillaries. Many general practitioners are skilled in dermatoscopy and are well placed to examine nailfold capillaries. The MDAD approach to nailfold dermatoscopy considers capillary morphology, diameter, architecture and density. In Raynaud's phenomenon, nailfold dermatoscopy assists in the diagnosis of an underlying connective tissue disease.

Nailfold capillary examination in Raynaud's phenomenon assists in distinguishing between primary Raynaud's and secondary Raynaud's that is associated with an underlying connective tissue disease. Instruments used to observe capillaries in the living skin have ranged from magnifying glasses to microscopes of varying designs and power.¹ Nailfold videocapillaroscopy represents the best of these methods to analyse microvascular abnormalities in autoimmune rheumatic diseases.² However, most rheumatologists do not have access to this technology.³

Dermatoscopy has been shown to be a reliable technique in the evaluation of morphological nailfold changes, permitting the differentiation of primary and secondary Raynaud's phenomenon.⁴ The results obtained by dermatoscopy are comparable to those described with other instruments.¹ Many Australian general practitioners (GPs) have experience in dermatoscopy as it assists with the diagnosis and treatment of melanoma and non-melanoma skin cancers. Dermatoscopy can be used to examine nailfold capillaries as well.

Raynaud's phenomenon and connective tissue diseases

Raynaud's phenomenon is an exaggerated response to cold or emotional stress with vasospasm and ischaemia of the extremities. It is characterised by the change of skin colour to white (vasoconstriction), then blue (cyanosis) and finally red (rapid blood reflow). The white colour change is shown in Figure 1.

Raynaud's phenomenon may be primary, due to a direct response to stimuli, or secondary, due to an underlying condition. Conditions associated with secondary Raynaud's phenomenon can be classified as rheumatological, haematological, occlusive arterial disease and miscellaneous (Box 1). An estimated 12.6% of patients with Raynaud's phenomenon develop the connective tissue disease scleroderma.⁵

In the assessment of Raynaud's phenomenon (Box 2), relevant history includes symptoms of an underlying condition, occupational use of vibrating tools, smoking, and aggravating medications. Examination should include the fingers (eg colour changes, ulcerations), joints (eg inflammatory arthropathy), skin (eg thickened skin, oedema in scleroderma and rashes) and magnified nailfold examination with dermatoscopy. The investigation of antinuclear antibody levels aids in the



Figure 1. White colour change in Raynaud's phenomenon

diagnosis of an underlying connective tissue disease.

Systemic sclerosis (scleroderma) is an autoimmune, collagen vascular disease of unknown aetiology that can be difficult to diagnose and treat. Skin manifestations include skin tightness and induration, often preceded by oedema. Skin induration initially affects the fingers and extends proximally. Clinical features also include telangiectasia, calcinosis

Box 1. Conditions associated with secondary Raynaud's phenomenon

Rheumatological

- Systemic sclerosis
- Mixed connective tissue disease
- Dermatomyositis
- Polymyositis
- Systemic lupus erythematosus
- Rheumatoid arthritis
- Sjögren's syndrome
- Vasculitis

Haematological

- Polycythaemia rubra vera
- Leukaemia and lymphoma
- Thrombocytosis
- Paraproteinaemias
- Mycoplasma infections (with cold agglutinins)
- Protein C, S and antithrombin III deficiencies
- Factor V leiden mutation
- Hepatitis B and C

Occlusive arterial disease

- External neurovascular compression
- Arteriosclerosis
- Thoracic outlet syndrome
- Thrombosis
- Embolisation
- Buerger's disease
- Thromboangiitis obliterans

Miscellaneous

- Carpal tunnel syndrome
- Acromegaly
- Myxedema
- Pheochromocytoma
- Medication-induced Raynaud's
- Diabetes
- Lung adenocarcinoma
- Occupational-induced Raynaud's – vibrating tools

and Raynaud's phenomenon. Raynaud's phenomenon often precedes skin and visceral fibrosis by years or decades and occurs in more than 90% of systemic sclerosis.⁶ Nailfold capillary abnormalities are present in more than 95% of patients with systemic sclerosis.²

Polymyositis and dermatomyositis are inflammatory myopathies that cause symmetric proximal muscle weakness that is not generally painful. Nailfold capillary changes may be present in dermatomyositis^{1,7} and polymyositis.⁷ Investigations often show a raised erythrocyte sedimentation rate, rheumatoid factor and creatine kinase. Muscle biopsy is crucial in the diagnosis.

Mixed connective tissue disease consists of Raynaud's phenomenon, arthralgia, arthritis, sclerodactyly and mild myositis. Nailfold capillary changes similar to those in systemic sclerosis are present in 50% of patients with mixed connective tissue disease.¹ The most common symptoms of undifferentiated connective tissue disease are Raynaud's phenomenon, arthralgia, arthritis, oral ulcerations and fever. Nailfold capillary

changes similar to those in systemic sclerosis may also be present in undifferentiated connective tissue disease.⁸

Non-rheumatic diseases

Hypertension and diabetes cause adverse effects on the cardiovascular system, including macrovascular and microvascular complications. The latter includes remodelling of small resistance arteries. A facet of hypertension-induced microvascular remodelling is a reduction in the density of capillaries.⁹ Higher systolic blood pressure is associated with lower dermal capillary density.¹⁰ The value of routine assessment of nailfold capillaries in patients with diabetes and hypertension in primary care was not found in a literature review.

The coronary slow flow phenomenon is the delayed opacification of coronary arteries at angiogram in the absence of significant stenosis.¹¹ Abnormalities in nailfold capillaries suggesting the presence of inflammation and anatomical changes were significantly higher in patients with coronary slow flow

Box 2. Assessment of Raynaud's phenomenon

History

- Colour changes – frequency, affected digits, triggers
- Rash, photosensitivity, migraines, ulcers, dysphagia
- Occupation – vibrating tools, cold exposure
- Smoking
- Aggravating medications – beta blockers, estrogen, sympathomimetics

Examination

- Fingers – colour changes, flexion deformities, sclerodactyly, calcinosis, ulcerations
- Peripheral pulses
- Joint examination – synovitis
- Skin – telangiectasia, malar rash, skin tightening/thickening
- Magnified nailfold examination – dermatoscopy or ophthalmoscopy

Investigations

- Blood – full blood count, erythrocyte sedimentation rate, urea and creatinine, antinuclear antibodies (ANA), extractible nuclear antigens (ENA), fasting BSL, coagulation profile
- Other blood tests if clinically indicated include creatine kinase (raised in polymyositis, dermatomyositis), rheumatoid factor and anti-CCP (raised in rheumatoid arthritis), hepatitis B and C serology, cold agglutinins (mycoplasma infection and lymphoma), 24-hour urinary catecholamines (pheochromocytoma), serum viscosity, serum protein and urine catecholamines (paraproteinaemias)
- Cervical rib X-ray if unilateral upper arm symptoms

phenomenon.¹¹ Cardiac syndrome X consists of chest pain, exercise-induced ischaemic ST segment changes and angiographically normal coronary arteries. Nailfold videocapillaroscopy in these patients has shown morphological changes similar to systemic inflammatory diseases.¹² Primary biliary cirrhosis is a chronic liver disease, presumably autoimmune in origin. A study found nailfold capillary abnormalities were present in 91% of patients with this condition, and 54% had capillary changes characteristic of systemic sclerosis.¹³

Nailfold dermatoscopy examination

The nailplate emerges from the proximal nailfold and is bordered on either side by the lateral nailfolds.

The capillaries in the proximal nailfold run parallel to the skin surface. The morphology of these capillaries, therefore, can be visualised well here (Figures 2, 3). Elsewhere, the skin capillaries are generally only seen as red dots as they project up from the upper dermal plexus into the dermal papillae. Nailfold capillaries can be seen with polarised and non-polarised dermatoscopes. If a non-polarised dermatoscope is used, transparent ultrasound gel between the glass plate and skin reduces the compressibility of vessels. The best visibility of the nailfold capillaries is generally at the fourth and fifth fingers of the non-dominant hand.¹⁴ GPs are encouraged to practise viewing nailfold capillaries regularly with dermatoscopy to improve their skill in the detection of abnormalities.

The emergence of low-cost, easy-to-use digital imaging systems has made good quality photography more accessible to practitioners.¹⁵ Many GPs are producing dermatoscopy photos due to the value of digital surveillance of atypical, pigmented skin lesions. Viewing the nailfold dermatoscopy photo on a monitor enables GPs to see the vessels with increased magnification.



Figure 2. Distal finger illustrating the location of the proximal nailfold



Figure 3. Normal looped nailfold capillaries

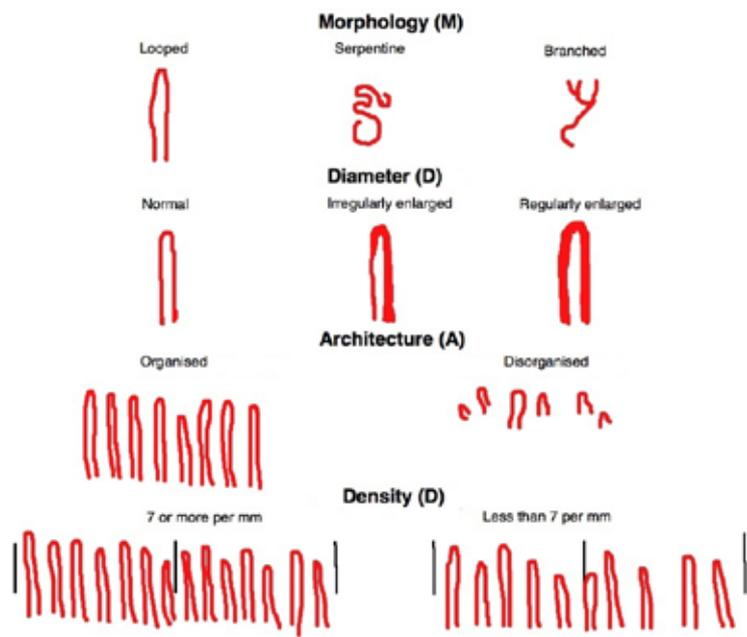


Figure 4. The MDAD approach to nailfold dermatoscopy



Figure 5. Nailfold dermatoscopy photo in a patient with Raynaud's phenomenon



Figure 6. Nailfold photo in a patient with systemic sclerosis

The MDAD approach to nailfold dermatoscopy

In nailfold capillary dermatoscopy the MDAD approach considers capillary morphology (M), diameter (D), architecture (A) and density (D) (Figure 4). Normal capillary morphology is a looped-shape appearance. Capillaries may be serpentine or tortuous, meaning they have multiple curves. Some tortuosity is relatively frequent in healthy subjects, especially in the elderly.¹⁴ An irregularly enlarged capillary diameter is present if a segment of the vessel is wider than the rest, but if the entire capillary is enlarged, then it is termed regularly enlarged. Architecture refers to how the capillaries are spread out. Evenly distributed capillaries are known as organised, and unevenly distributed capillaries are known as disorganised. The mean nailfold capillary density in the distal row of capillaries in a healthy individual is seven per millimetre.^{16,17} Dermatoscopes have millimetre (mm) measurement markings, so the number of capillaries in one millimetre can be counted.

The MDAD approach to nailfold dermatoscopy is used to assess the nailfold photo in a patient with Raynaud's phenomenon (Figure 5). The morphology is looped vessels, diameter of a few vessels is irregularly enlarged (arrows), architecture is mildly disorganised and density is seven capillaries or more per millimetre.

In systemic sclerosis, nailfold capillary dermatoscopy features include irregularly and regularly enlarged vessels, microhaemorrhages, reduced capillary density, branching vessels and disorganised architecture.

Three patterns of microangiopathy are seen in systemic sclerosis and are termed early, active and late. Table 1 summarises the dermatoscopy appearances in each.

Figure 6 is a nailfold photo of a patient with systemic sclerosis, showing an early pattern of microangiopathy with irregularly enlarged capillaries. Hypertension is associated with a reduction in nailfold capillary density.⁸ Other nailfold abnormalities include microbleeding, serpentine and branching vessels.

Conclusion

Dermatoscopes are useful devices in examining nailfold capillaries. Many GPs are skilled in dermatoscopy and are therefore well placed to examine nailfold capillaries. The MDAD approach to nailfold dermatoscopy considers capillary morphology, diameter, architecture and density. In Raynaud's phenomenon nailfold dermatoscopy assists in the diagnosis of an underlying connective tissue disease.

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References

1. Bergman R, Sharony L, Scapira D, Nahir MA, Balbir-Gulman A. The handheld dermatoscope as a nail-fold capillaroscopic instrument. *Arch Dermatol* 2003;139:1027–30.

2. Cutolo M, Sulli A, Secchi ME, Paolino S, Pizzorni C. Nailfold capillaroscopy is useful for the diagnosis and follow-up of autoimmune rheumatic diseases: A future tool for the analysis of microvascular heart involvement? *Rheumatology* 2006;45:iv43–46.
3. Herrick AL, Cutolo M. Clinical implications from capillaroscopic analysis in patients with Raynaud's phenomenon and systemic sclerosis. *Arthritis Rheum* 2010;62:2595–604.
4. Beltrán E, Toll A, Pros A, Carbonell J, Pujol RM. Assessment of nailfold capillaroscopy by x 30 digital epiluminescence (dermoscopy) in patients with Raynaud phenomenon. *Br J Dermatol* 2007;156:892–98.
5. Koenig M, Joyal F, Fritzier MJ, et al. Autoantibodies and microvascular damage are independent predictive factors for the progression of Raynaud's phenomenon to systemic sclerosis. *Arthritis Rheum* 2008;58:3902–12.
6. Jimenez SA, Derk CT. Following the molecular pathways toward an understanding of the pathogenesis of systemic sclerosis. *Ann Intern Med* 2004;140:37–50.
7. Ganczarzyk ML, Lee P, Armstrong SK. Nailfold capillary microscopy in polymyositis and dermatomyositis. *Arthritis Rheum* 1988;31:116–19.
8. Ohtsuka T, Tamura T, Yamakage A, Yamazaki S. The predictive value of quantitative nailfold capillary microscopy in patients with undifferentiated connective tissue disease. *Br J Dermatol* 1998;139:622–29.
9. Agabiti-Rosei E. From macro- to microcirculation: Benefits in hypertension and diabetes. *J Hypertens Suppl* 2008;26:S15–19.
10. Schiffrin EL. Remodelling of resistance arteries in essential hypertension and effects of antihypertensive treatment. *Am J Hypertens* 2004;17:1192–200.
11. Yuksel S, Pancar Yuksel E, Yenercag M, et al. Abnormal nailfold capillaroscopic findings in patients with coronary slow flow phenomenon. *Int J Clin Exp Med* 2014;7:1052–58.
12. Pasqui AL, Puccetti L, Di Renzo M, et al. Structural and functional abnormality of systemic microvessels in cardiac syndrome X. *Nutr Metab Cardiovasc Dis* 2005;15:56–64.
13. Fonollosa V, Simeón CP, Castells L, et al. Morphologic capillary changes and manifestations of connective tissue diseases in patients with primary biliary cirrhosis. *Lupus* 2001;10:628–31.
14. Gallucci F, Russo R, Buono R, Acampora R, Madrid E, Uomo G. Indications and results of videocapillaroscopy in clinical practice. *Adv Med Sci* 2008;53:149–57.
15. Witmer WK, Lebovitz PJ. Clinical photography in the dermatology practice. *Semin Cutan Med Surg* 2012;31:191–99.
16. Ingegnoli F, Gualtierotti R, Lubatti C, et al. Nailfold capillary patterns in healthy subjects: A real issue in capillaroscopy. *Microvasc Res* 2013;90:90–95.
17. Wildt M, Hesselstrand R, Åkesson A, Scheja A. Simple counting of nailfold capillary density in suspected systemic sclerosis – 9 years' experience. *Scand J Rheumatol* 2007;36:452–57.

Table 1. Microangiopathy patterns in systemic sclerosis

	Early	Active	Late
Morphology (M)	Looped	Looped, branched	Looped, branched
Diameter (D)	Regularly or irregularly enlarged	Regularly enlarged	Regularly enlarged
Architecture (A)	Organised	Disorganised	Disorganised
Density (D)	Normal	Mild reduction	Severe reduction

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