The Handheld Dermatoscope as a Nail-Fold Capillaroscopic Instrument

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Background: The presence of nail-fold capillary abnormalities may be useful in diagnosing several connective tissue disorders, including scleroderma, dermatomyositis, and mixed connective tissue disease, and in differentiating primary Raynaud phenomenon from Raynaud phenomenon due to scleroderma and mixed connective tissue disease. Capillaroscopy, however, usually requires special equipment and may be time consuming.

Purpose: To investigate the potential use of the unmodified common handheld dermatoscope as a capillaroscopic instrument.

Subjects: The study included 106 patients who were consecutively referred and a control group of 170 healthy subjects or patients with unrelated skin disorders.

Methods: A nail-fold capillaroscopic examination using a standard handheld dermatoscope was performed on all fingers of each subject. A scleroderma-dermatomyositis pattern was defined as the presence of 2 or more of the following findings in at least 2 nail folds: enlargement of capillary loops, loss of capillaries, disorganization of the normal distribution of capillaries, “budding” (“bushy”) capillaries, twisted enlarged capillaries, and capillary hemorrhages (extravasates).

Results: A scleroderma-dermatomyositis pattern was found in 19 (70.4%) of 27, 7 (63.6%) of 11, and 4 (50%) of 8 patients with scleroderma, dermatomyositis, and mixed connective tissue disease, respectively. These frequencies were statistically significantly higher than a null percentage of scleroderma-dermatomyositis pattern in the control group (P<.001) and a scleroderma-dermatomyositis pattern in only 1 (4.5%) of 22 patients with systemic lupus erythematosus as well as in 2 (5.3%) of 38 patients with Raynaud phenomenon but without evidence of a connective tissue disorder (P<.01).

Conclusions: The capillaroscopic results obtained with the dermatoscope are comparable to those described with other instruments. Therefore, the unmodified handheld dermatoscope may be used as a capillaroscopic instrument to detect a scleroderma-dermatomyositis pattern and to help the dermatologist in the clinical diagnosis of connective tissue disorders.

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In connective tissue disease (CTD), local vascular changes can be studied by capillary microscopy of the nail fold, where abnormalities seem to appear earlier in the course of the disease than at other sites of the skin of the fingers.1-4 The skin area is easily accessible for examination, and the capillaries can be studied better in the nail fold than at other sites, as the arrangement of the capillaries in the nail fold allows visualization of the complete capillary loops.5 Several studies have shown the usefulness of in vivo capillary microscopic examination of patients with CTDs.2,3,5 Of the capillary abnormalities observed in these disorders, the most characteristic occur in scleroderma, dermatomyositis, and mixed CTD (MCTD) as well as in syndromes that overlap with scleroderma.3 The presence of these abnormalities may aid in early diagnosis of these disorders and in the differential diagnosis of primary Raynaud phenomenon (RP) from RP due to scleroderma and MCTD.2,3,6-9

The instruments used to observe capillaries in the living skin have ranged from a magnifying glass to microscopes of various designs and magnifying power.2,4,7,10 A total magnification of ×12 to ×14 offers a wide field of observation and a perception of depth, the best conditions for evaluating the overall pattern of the capillary bed, both normal and abnormal.2 When detailed observations of individual capillaries are desired, higher magnification is necessary and can usually be obtained with a stereomicroscope.2,4,7,10
The handheld dermatoscope has been recently used by dermatologists as an aid in the differential diagnosis of pigmented skin lesions. In its common form, it is a relatively simple tool, which, like capillaroscopy, involves the application of immersion oil to the skin and offers a constant magnification power of 9.3-fold. The present study was performed to investigate the potential use of the unmodified common handheld dermatoscope as a capillaroscopic instrument.

METHODS

SUBJECTS

The study population consisted of 106 patients (88 women and 18 men; age range, 18-75 years [mean age, 44 years]) referred consecutively by the Departments of Dermatology and Rheumatology, Rambam Medical Center, Haifa, Israel, and 170 randomly selected control subjects (143 women and 27 men; age range, 18-77 years [mean age, 40.5 years]). The patients were diagnosed as having the following disorders: scleroderma (n=27), dermatomyositis (n=11), systemic lupus erythematosus (SLE) (n=22), MCTD (n=8), and RP without evidence of underlying CTD (n=38). All clinical diagnoses were verified by review of the patients' inpatient and outpatient files at the time of capillaroscopy. The control group consisted of randomly selected healthy subjects without any skin disease or systemic disease and a few patients with skin diseases unrelated to CTD.

TECHNIQUE

A drop of immersion oil was placed on the proximal aspect of the nail folds of every finger of each subject. A dermatoscope (Delta 10; Heine Optotechnik, Herrsching, Germany) with a magnification power of 9.3-fold was then placed on each proximal nail fold and viewed through the ocular eyepiece (Figure 1). All examinations were performed by the same investigator (R.B.). Representative photographs were taken with a commercially available camera (Dermaphot; Heine Optotechnik).

STUDY PARAMETERS

The following parameters were recorded for each patient: enlargement of capillary loops, loss of capillaries, disorganization of the normal distribution of capillaries, “budding” ("bushy") capillaries, twisted capillaries, and hemorrhages (extravasates). The scleroderma-dermatomyositis (SD) pattern was characterized according to Maricq, ie, enlargement of capillary loops, loss of capillaries, disorganization of the orderly appearance of the normal capillary bed, budding of capillaries, and capillary hemorrhages (extravasates). Two or more of these findings in at least 2 nail folds were required for the definition of an SD pattern. Any findings that fell short of this definition were classified as nondiagnostic.

STATISTICAL ANALYSIS

The data were analyzed using a commercially available software package (Statistics Products Services Solutions for Windows). A $\chi^2$ test was used to analyze differences between groups; $P<.05$ was considered statistically significant.

RESULTS

STUDY POPULATION

The results are presented in the Table, and representative photographs are shown in Figures 2, 3, and 4. Of the 27 patients with scleroderma, 19 (70.4%) demonstrated an SD pattern, 2 (7.4%) had nondiagnostic findings, and 6 (22.2%) had normal capillary loops. Among the 19 patients with an SD pattern, the abnormal findings included enlargement of capillary loops (94%), loss of capillaries (52%), disorganization of the normal distribution of capillaries (82%), budding capillaries (82%), and extravasates (82%). Of the 11 patients with dermatomyositis, 7 (63.6%) had an SD pattern and 4 (36.4%) had a normal pattern. Of the 8 patients with MCTD, 4 (50%) had an SD pattern, 2 (25%) had nondiagnostic findings, and 2 (25%) had a normal pattern. Of the 22 patients with SLE, only 1 (4.5%) had an SD pattern; 4 (18.2%) had nondiagnostic findings, including twisted unenlarged capillaries and extravasates; and 17 (77.3%) had a normal pattern. Of the 38 patients with
RP but without an apparent CTD at the time of diagnosis, 33 (86.8%) had a normal nail-fold capillary pattern, 2 (5.3%) had an SD pattern, and 3 (7.9%) had nondiagnostic findings, mainly extravasates and twisted unenlarged capillaries.

CONTROL SUBJECTS

None of the 170 control subjects demonstrated an SD pattern. Eighteen subjects (10.6%) demonstrated nondiagnostic abnormal findings, mainly extravasates and twisted unenlarged capillaries.

STATISTICAL SIGNIFICANCE

The frequencies of an SD pattern in the scleroderma, dermatomyositis, and MCTD groups, which were 70.4%, 63.6%, and 50%, respectively, were significantly higher than the null percentage in the control group ($P < .001$). The 70.4% and 63.6% frequencies of an SD pattern in the scleroderma and dermatomyositis groups, respectively, were also significantly higher than the 4.5% and 5.3% frequencies in the SLE and RP groups, respectively ($P < .001$). The 50% frequency of an SD pattern in the MCTD group, which was the smallest group in the study, was also significantly higher than the 4.5% ($P < .01$) and 5.3% ($P < .005$) frequencies in the SLE and RP groups, respectively.

The frequencies of the nondiagnostic findings, which were 25% and 18.2% in the MCTD and SLE groups respectively, were higher than the 7.4%, 7.9%, 10.6%, and null percentage frequencies in the scleroderma, RP, control, and dermatomyositis groups, respectively, but these differences were not statistically significant ($P > .37$).

COMMENT

Capillaroscopy requires special equipment, including a biomicroscope or operating microscope,³ which often necessitates an additional appointment or a referral to a specialized center.¹² The ophthalmoscope has been advocated¹³ for capillaroscopic examination, but it has the disadvantage of having a field that is too small for proper investigation.³ The dermatoscope has a relatively large field of view and offers a simple, quick, and inexpensive method with an instrument that many practicing dermatologists already have. Bauersachs and Lossner¹² studied 18 patients with RP using a modified dermatoscope in which the single-lens magnification was changed from $\times 10$ to $\times 12$; the lightbulb was tinted green; the original bulbs were replaced by 2.5-V kryptogen bulbs; and a graded contact slide was added. Also, a carbachol gel was substituted for the common immersion oil. The results of their capillaroscopic examination were equivalent to those obtained by standard capillary microscopy.¹² The average examination time, which was 18 minutes with the standard microscope, was reduced to only 4 minutes with their modified dermatoscope.¹² The disadvantage of their method is the need to modify the dermatoscope or to purchase an additional specially modified dermatoscope. In the present study, we used the ordinary unmodified standard dermatoscope and the same immersion oil that is used for the diagnosis of pigmented lesions.

Previous studies have shown nail-fold capillary abnormalities with a sensitivity rate of 0.82 to 0.97 and a specificity rate of 0.89 to 0.97 in scleroderma compared with closely related CTDs and isolated RP.³,¹⁴,¹⁵ Nail-fold abnormalities constituting an SD pattern have also been demonstrated in 54% to 64% of patients with MCTD,⁵,¹⁶ in 83% of patients with dermatomyositis,¹⁷ and in only 2.0% to 4.8% of patients with SLE.⁵,¹⁶ In SLE and

Figure 2. Normal nail-fold capillary pattern consisting of even distribution of thin hairpinlike capillary loops. Note the compression of the oil film with the dermatoscopic front plate.

Figure 3. An abnormal nail-fold capillary pattern constituting a scleroderma-dermatomyositis pattern. There are enlarged capillary loops and a single extravasate.

Figure 4. An abnormal nail-fold capillary pattern constituting a scleroderma-dermatomyositis pattern. The capillary distribution is distorted and irregular. There are enlarged capillaries, including “budding” capillaries (thin arrow), twisted capillaries (thick arrow), and extravasates (asterisk).
dermatomyositis, nonspecific abnormal findings were observed in 24.0% and 13.6% of the patients, respectively, and an “SLE capillaroscopic pattern,” defined as tortuous meandering capillaries and a prominent subpapillary plexus, was noted in 57.0% and 22.7% of the patients, respectively.16,18 A recent study using an optical microscope and a video camera with a 60- to 240-fold magnification demonstrated an SD pattern in only 43% of patients with scleroderma and some capillary abnormalities short of an SD pattern in 5% to 15% of the normal controls.10 Houtman et al4 used a stereo-zoom microscope to study nail-fold capillaries with an ultimate magnification demonstrated an SD pattern in only 43% whereas the capillaroscopic pattern is close to that of normal controls, although giant loops were very rare and were much more common in the scleroderma and MCTD groups.5 These findings underscore the importance of the proper definition of an SD pattern, which will lead to maximum sensitivity and specificity. The most widely used definition of an SD pattern, which was published by Mariqc,6 includes the presence of definitely or enormously dilated capillaries, avascular areas, hemorrhages, budding capillaries, and loss of the normal capillary bed. The enlargement of capillaries seems to be the most significant finding.19 In the present study, we applied a strict definition of an SD pattern according to which at least 2 of Maricq’s parameters had to be present in at least 2 nail folds. Using these criteria and the dermatoscope, we obtained comparable results to those of studies in which other instruments were used; ie, the frequencies of an SD pattern, which were 70.4%, 63.6%, and 50% in the scleroderma, dermatomyositis, and MCTD groups, respectively, were statistically significantly higher than the frequencies of 4%, 5.3%, and 0% in the SLE, RP without CTD, and control groups, respectively. Nondiagnostic findings were found to be more frequent in the SLE and MCTD groups than in the other groups, although these differences were not statistically significantly different.

One of the main advantages of nail-fold capillaroscopy is that it can help to differentiate primary RP from RP due to scleroderma or MCTD. In primary RP, the capillaroscopic pattern is close to that of normal controls, whereas the capillaroscopic patterns of RP due to scleroderma and MCTD are similar to the respective capillaroscopic patterns of these CTDs.2,4,20-22 In contrast, most patients with SLE and RP do not have an SD pattern.5,20 In the present study, an SD pattern was demonstrated in only 5% of the patients with RP but without signs of CTD at the time of diagnosis.

In conclusion, the capillaroscopic results obtained with the unmodified handheld dermatoscope are comparable to those described with other instruments. Therefore, the common dermatoscope may be used as a capillaroscopic instrument to detect an SD pattern and to help the clinical dermatologist in diagnosing CTDs.