Nailfold videocapillaroscopy in primary antiphospholipid syndrome (PAPS)

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Objectives. To evaluate microcirculatory changes (functional and morphological) in primary antiphospholipid syndrome (PAPS) patients.

Methods. Thirty-one patients were examined using nailfold videocapillaroscopy (18 PAPS patients and 13 healthy subjects). The patients were subdivided into two subgroups, with lupus anticoagulant (n = 8) and with anticardiolipin (n = 10) antibodies. Capillary morphology was determined; diameters (μm) and functional capillary density (FCD, number capillaries/mm²) were measured in control conditions. Blood flow velocity (CBFV, mm/s) was also evaluated at rest and after release of 60 s arterial occlusion.

Results. The percentage of subjects with at least one morphological alteration in the observed capillaries was 77.8% for patients and 21.3% for healthy subjects. Capillary diameters (μm) [afferent (AD), apical (APD) and efferent (ED)] were significantly smaller (mean ± s.d.: AD-PAPS, 7.4 ± 2.1; control, 9.1 ± 2.6, P = 0.063; APD-PAPS, 11.6 ± 2.3; control, 14.4 ± 3.8, P = 0.015; ED-PAPS, 8.4 ± 2.0; control, 10.9 ± 3.2, P = 0.011) in PAPS patients compared with controls. FCD (PAPS, 8.5 ± 3.2; control, 8.3 ± 2.9, P = 0.862), mean resting CBFV (PAPS, 0.73 ± 0.31; control, 0.88 ± 0.41, P = 0.278), mean peak CBFV after occlusion (PAPS, 1.07 ± 0.52; control, 1.59 ± 0.91, P = 0.063) and mean time (s) to reach it (PAPS, 5.2 ± 1.7; control, 4.6 ± 1.8, P = 0.101) were not statistically different between the two groups.

Conclusion. Our results suggest that nailfold capillary morphology is altered in patients with PAPS, but these changes could not be correlated to impairment of functional parameters.

Key words: Antiphospholipid syndrome, Videocapillaroscopy, Reactive hyperaemia, Nailfold capillaries.
The functional capillary density was determined as the number of capillaries/mm² with flowing red blood cells, and the morphology was evaluated according to Gibson et al. [15]. Capillary loop diameters, afferent (AD), apical (APD) and efferent (ED), were also assessed.

For measurements of capillary blood flow velocity (CBFV), a pressure cuff (1 cm wide) was placed around the proximal phalanx and connected to a mercury manometer. Resting values of CBFV were obtained for at least 1 min before the cuff was inflated above systolic pressure for 1 min. The peak increase in CBFV above rest and the time taken to reach it were measured [13]. Measures were obtained using the software CapImage [16].

Results are presented as mean ± S.D. The parametric Student’s t test and the non-parametric Mann–Whitney test were used, both with P < 0.05 indicating statistical significance.

Results

Mean age (yr) was 30.2 ± 6.3 for patients and 34.5 ± 7.3 for controls, and median PAPS time since diagnosis was 2.5 yr. Arterial thrombosis, independent of venous thrombosis and/or fetal loss, was present in eight patients (44.4%). No patient showed Raynaud’s syndrome during the examination. Patients were using oral anticoagulant (warfarin, almost 80%) and/or aspirin (100 mg/day, 27.8%).

Capillary diameters (μm) [afferent (AD), apical (APD) and efferent (ED)] were significantly smaller in PAPS patients compared with controls (AD-PAPS, 7.4 ± 2.1; control, 9.1 ± 2.6, P = 0.063; APD-PAPS, 11.6 ± 2.3; control, 14.4 ± 3.8, P = 0.015; ED-PAPS, 8.4 ± 2.0; control, 10.9 ± 3.2, P = 0.011) (Fig. 1). There were also differences in capillary diameter between LA and aCL patients (Fig. 1).

Functional capillary density (number of capillaries/mm²) (PAPS, 8.5 ± 3.2; control, 8.3 ± 2.9, P = 0.862), mean resting CBFV (mm/s) (PAPS, 0.73 ± 0.31; control, 0.88 ± 0.41, P = 0.278), mean peak CBFV after occlusion (mm/s) (PAPS, 1.07 ± 0.52; control, 1.59 ± 0.91, P = 0.063) and mean time to reach it (s) (PAPS, 5.2 ± 1.7; control, 4.6 ± 1.8, P = 0.101) were not different between the two groups.

Haemorrhages or deposits of haemosiderin were not observed. Morphological alterations (apical coiling, one crossing between loops with moderate coiling and dual crossing between loops) were observed in 14 out of 18 PAPS patients (77.8%) and in three loops with moderate coiling and dual crossing between loops).

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Fig. 1. Capillary loop diameters (CD, in μm) in patients (P) vs controls (C) and lupus anticoagulant (LA) vs anticardiolipin antibody (aCL) groups.

Discussion

This study evaluated morphological and functional alterations of the microcirculation in PAPS. FCD, one of the main functional parameters, was not different between the groups and subgroups, suggesting similar perfusion in patients and controls.

Regarding red blood cell velocities and time to reach peak velocity, there was no difference between PAPS patients and controls or between LA and aCL subjects. In the morphological evaluation, however, differences were found in the apical and efferent diameters between the PAPS and control groups, with smaller diameters in PAPS patients. Diameters were measured as the width of the red blood cell column because the capillary wall was not visible. Since average red blood cell velocity was similar in patients and controls, and diameters were smaller in patients than in controls, lower quantities of red blood cells and therefore smaller amounts of O₂ were available to the tissue surrounding these capillaries in patients. In the subgroups LA and aCL, apical capillary diameter was smaller in LA patients, suggesting an impairment of the circulation in this region.

At least one unspecified morphological alteration was found in 14 patients (77.8%). Morphological changes in capillaries of 13 patients with aPL, eight with PAPS and five with SAPS (APS + SLE), with loop dilation in both PAPS (63%) and SAPS (100%), have been described [17]. This study had no control group and did not specify the region of the loop in which the dilation occurred. In a case–control study (n = 66) in aCL patients with isotype IgG, a high incidence of capillary morphological abnormalities was reported in both groups (70% in patients and 78% in controls) [18], but only two patients (6.1%) with aPL and 10 controls (30.3%) had capillary dilation. In the present study, only the presence of aCL was taken into account and individuals without any autoimmune disease were included. The greater prevalence of digital gangrene in the control group (30 vs 6%, P = 0.02) suggests that these patients, despite the absence of aPL, could have worse vascular disease than the other group.

A recent case–control study [19] evaluated the association of morphological abnormalities and the presence of aPL, separated according to IgG/IgM concentrations, in patients with rheumatic diseases (SLE, PAPS, undifferentiated connective tissue disease) or Raynaud’s disease. No morphological changes were observed, but capillary haemorrhages and haemosiderin deposits were seen (53.3%), with a higher incidence in IgG+IgM+ patients (75%). Pericapillary deposits of haemosiderin or haemorrhages were not found in our study.

In previous studies [17, 18], morphological changes were observed. In our study, we found at least one unspecified alteration in 77.8% patients compared to 23.1% controls without any significant blood flow impairment. Perhaps the anticoagulant treatment used by 80% of the patient group accounts, at least in part, for these findings.

Our results showed a higher incidence of morphological changes in nailfold capillaries of PAPS patients compared with controls, without significant impairment of functional parameters.

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References