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Increasing the “region of interest” and “time of interest”, both reduce the variability of blood flow measurements using laser speckle contrast imaging

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Auteur	Rousseau, Pascal [1], Mahé, Guillaume [2], Haj-Yassin, Firas [3], Durand, Sylvain [4], Humeau-Heurtier, Anne [5], Lefthériotis, Georges [6], Abraham, Pierre [7]
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Résumé en anglais	ObjectiveBoth spatial variability and temporal variability of skin blood flow are high. Laser speckle contrast imagers (LSCI) allow non-contact, real-time recording of cutaneous blood flow on large skin surfaces. Thereafter, the observer can define different sizes for the region of interest (ROI) in the images to decrease spatial variability and different durations over which the blood flow values are averaged (time of interest, TOI) to decrease temporal variability. We aimed to evaluate the impact of the choices of ROI and TOI on the analysis of rest blood flow and post occlusive reactive hyperemia (PORH). Methods Cutaneous blood flow (CBF) was assessed at rest and during PORH. Three different sizes of ROI (1 mm2, 10 mm2 and 100 mm2), and three different TOI (CBF averaged over 1 s, 15 s, and 30 s for rest, and over 1 s, 5 s and 10 s for PORH peak) were evaluated. Inter-subjects and intra-subjects coefficient of variations (inter-CV and intra-CV) were studied. Results The inter-subject variability of CBF is about 25% at rest and is moderately improved when the size of the ROI increases (inter-CV = 31%, for 1 s and 1 mm2 versus inter-CV = 23%, for 15 s and 100 mm2). However, increasing the TOI does not improve the results. The variability of the PORH peak is lower with an inter-CV varying between 11.4% (10 s and 100 mm2) and 21.6% (5 s and 1 mm2). The lowest intra-CV for the CBF at rest was 7.3% (TOI of 15 s on a ROI of 100 mm2) and was 3.1% for the PORH peak (TOI of 10 s on a ROI of 100 mm2). Conclusion We suggest that a size of ROI larger than 10 mm2 and a TOI longer than 1 s are required to reduce the variability of CBF measurements both at rest and during PORH peak evaluations at the forearm level. Many technical aspects such as comparison of laser speckle contrast imaging and laser Doppler imaging or the effect of skin to head distance on recorded values with LCSI are required to improve future studies using this fascinating clinical tool.
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