



## Optimisation of movement detection and artifact removal during laser speckle contrast imaging

Submitted by Anne Humeau-Heurtier on Wed, 11/26/2014 - 10:38

Titre	Optimisation of movement detection and artifact removal during laser speckle contrast imaging
Type de publication	Article de revue
Auteur	Omarjee, Loukman [1], Signolet, Isabelle [2], Humeau-Heurtier, Anne [3], Martin, Ludovic [4], Henrion, Daniel [5], Abraham, Pierre [6]
Editeur	Elsevier
Type	Article scientifique dans une revue à comité de lecture
Année	2015
Langue	Anglais
Date	Jan-01-2015
Pagination	75-80
Volume	97C
Titre de la revue	Microvascular Research
ISSN	0026-2862

## Introduction

Laser speckle contrast imaging (LSCI) allows an easy non-contact monitoring of the cutaneous blood flow (CBF), but is highly sensitive to movement artifacts (ARTm). Subtraction of a signal recorded on an adhesive opaque surface (AOS) close to the area of interest was reported as a mean of reducing noise from the raw skin LSCI (LSCI<sub>sk</sub>) signal, provided an individual calibration was performed. Assuming that  $AOS = a \cdot CBF + b \cdot ARTm$ , an ideal patch should completely block the light reflection due to CBF and thus be insensitive to skin blood flow changes (" $a$ "  $\sim 0$ ), while keeping a reflection signal amplitude similar to the one from the skin in case of artifact (" $b$ "  $\sim 1$ ). This ideal AOS has not been determined and may discriminate flow from movements during LSCI recordings.

## Materials and methods

We tested different AOSs to determine their " $a$ " and " $b$ " parameters in 35 and 34 healthy volunteers, respectively. The AOS surface providing results as close as possible to an ideal AOS, was used for a point-by-point de-noising of post occlusive reactive hyperemia (PORH) on two different days in 15 new subjects. Correlation of raw, smoothed (average smoothing over 1 s intervals) and denoised signals was tested through a cross-correlation analysis of the two POHR tests.

## Results

The optimal " $a$ " and " $b$ " values were obtained with a homemade bilayer adhesive patch ( $a = 0.06 \pm 0.05$  and  $b = 1.03 \pm 0.17$ ) whereas other tested AOS had " $a$ " values ranging from 0.05 to 0.23 and " $b$ " values ranging from 2.69 to 3.82. Using the bilayer adhesive patch the cross-correlation between the two tests of POHR increased from  $0.330 \pm 0.128$  for raw, to  $0.461 \pm 0.168$  for smoothed and  $0.649 \pm 0.128$  for denoised signals respectively ( $p < 0.05$  from raw coefficients).

## Conclusion

The home-made bilayer adhesive seems the optimal AOS for the removal of ARTm from the LSCI<sub>sk</sub> signal while respecting CBF signal. This specific AOS allows for an efficient de-noising of LSCI measurements without the need for individual calibration.

Résumé en anglais

URL de la notice

<http://okina.univ-angers.fr/publications/ua5534> [7]

DOI

10.1016/j.mvr.2014.09.005 [8]

Lien vers le document

<http://dx.doi.org/10.1016/j.mvr.2014.09.005> [8]

Titre abrégé

Microvascular Research

---

## Liens

[1] [http://okina.univ-angers.fr/publications?f\[author\]=9239](http://okina.univ-angers.fr/publications?f[author]=9239)

[2] [http://okina.univ-angers.fr/publications?f\[author\]=9240](http://okina.univ-angers.fr/publications?f[author]=9240)

[3] <http://okina.univ-angers.fr/a.hum/publications>

[4] <http://okina.univ-angers.fr/ludovic.martin/publications>

[5] <http://okina.univ-angers.fr/d.henrion/publications>

[6] <http://okina.univ-angers.fr/pierre.abraham/publications>

[7] <http://okina.univ-angers.fr/publications/ua5534>

[8] <http://dx.doi.org/10.1016/j.mvr.2014.09.005>

Publié sur *Okina* (<http://okina.univ-angers.fr>)