REAL-TIME MICROCIRCULATION IMAGING

PeriCam PSI System

YOUR PARTNER IN MICROCIRCULATION
INTRODUCTION

The PeriCam PSI System is a blood perfusion imager based on Laser Speckle Contrast Analysis (LASCA) technology. LASCA provides new means to study the microcirculation in ways that were not possible in the past. It allows visualization of tissue blood perfusion in real-time and combines dynamic response with spatial resolution. There is no influence on the perfusion, as no direct contact to the tissue is needed, nor dyes or tracer elements.

EXAMPLES HUMAN

Endothelial dysfunction

Endothelial dysfunction is one of the key events in the development of atherosclerosis and has been confirmed in patients with cardiovascular related diseases. Owing to its accessibility, the skin microcirculation is frequently used as a model to assess the general condition of the endothelium. Blood perfusion imaging with the PeriCam PSI System, in combination with iontophoresis, post-occlusive reactive hyperemia or thermal challenge, has proven to be an excellent tool for endothelial function studies.1

Burns

Burn wounds are not always straightforward to judge clinically. Early assessment of burn depth is crucial to avoid unnecessary surgery or potential hypertrophic scarring. The PeriCam PSI System measures the status of the skin microcirculation, reflecting the burn depth. Changes in the skin blood flow over time will reveal the wound healing potential. Increased activity indicates that the microcirculation is functioning and that there is a higher degree of wound healing potential.2

Raynaud’s phenomenon

Raynaud’s phenomenon is characterized by a vasospasm in the extremities as a response to cold temperatures, for example. The PeriCam PSI System can be used to follow these vascular changes in order to understand the underlying mechanisms. It has also proven useful to distinguish between secondary and primary Raynaud, as well as differentiating between established and early disease.3,4

EXAMPLES ANIMALS

Middle Cerebral Artery Occlusion Model – Stroke

Middle Cerebral Artery Occlusion (MCAO) is a commonly used stroke model in mice and rats. A major drawback with this model is the risk of incomplete occlusion upon filament insertion. As a quality control, the cortical blood flow can be monitored to ensure that a stroke, in fact, has been induced.5 The PeriCam PSI System provides data displaying both the dynamics and the spatial distribution of the perfusion throughout the procedure in real time. This opens up the possibility to not only confirm complete occlusion, but also to study the extent of the stroke by quantifying the affected area (mm²).

Ischemic hind limb model

The ischemic hind limb model is an animal model in which ischemia is induced by femoral artery ligation. It is often used to investigate the formation of new blood vessels during angiogenesis and arteriogenesis. In order to evaluate the model, blood perfusion imaging is commonly used. The PeriCam PSI System will not only provide high resolution images of the blood perfusion distribution in the legs, but also opens up the possibility to follow the vascular dynamics after heat exposure, for example.

Cortical spreading depolarization

It is well known that cerebral blood flow is coupled to the neuronal response in the brain. Events, such as cortical spreading depolarization/depression (CSD), may therefore be characterized by studying changes in the cerebral blood flow. The PeriCam PSI System has proven useful for this purpose, as it is possible to investigate changes in high resolution and at high speed. Data evaluation is facilitated by software features, such as viewing the data as video recordings and applying different types of color scales.

**PeriCam PSI System:**

**Fast**
- Up to 100 images per second

**Detailed**
- 10,000 pixels/cm² (100 µm/pixel) NR
- 250,000 pixels/cm² (20 µm/pixel) HR

**Instant**
- Real-time processing of data

**Controlled**
- Automatic background compensation once per second
- Optical and polarizing filters

**Two models**
- PeriCam PSI NR - Larger measurement area (24x24 cm), robust arm, normal resolution
- PeriCam PSI HR - Advanced microscopic type stand for exact positioning, high resolution

**LASCA – Laser Speckle Contrast Analysis**

A 785 nm laser illuminates the sample creating a speckle pattern. The speckle pattern is recorded by a CCD camera. Variations in the speckle pattern are analyzed and presented as blood perfusion images in real-time.

**Simple to Get Started**

- Flexible to adjust at any angle
- Color camera for documentation
- Automatic working distance calculation
- Pre-define Regions Of Interest ROIs

**Analyze Data While Recording**

- Instant update of data, graphs and images
- Add/Edit ROIs during measurement
- Automatic background compensation once per second
- Stable and accurate results at varying lighting conditions

**Advanced Data Reviewing**

- Edit ROIs for single image, complete run or sections of a run
- Time periods Of Interest – TOIs
- Perfusion overlay feature
- View recording in playback mode at different speeds

**Microcirculation**

The microcirculation refers to the blood flow through the smallest vessels in the circulatory system, i.e. arterioles, venules, shunts and capillaries.

Images, courtesy of Uppsala University, Sweden

**WHAT IS LASER SPECKLE CONTRAST ANALYSIS (LASCA)?**
### PeriCam PSI System Specifications

**Measurement Principle:** LASCA (Laser Speckle Contrast Analysis)

**Image Size (Maximum):**
- Normal Resolution model: ~24 x 24 cm (at 40 cm)
- High Resolution model: ~20 x 27 mm

**Image Acquisition Rate:**
- 50 Hz: 94, 44, 21, 10, 5, 2, 1, 0.5, 0.2 images per second
- 60 Hz: 112.8, 52.8, 25.2, 19.2, 12, 6, 2.4, 1.2, 0.6, 0.2 images per second
- Automatic frequency detection

**Precision:** +/- 4% (Motility Standard), +/- 3 PU (Zero Perfusion)

**Accuracy:** +/- 4% (Motility Standard), +/- 3 PU (Zero Perfusion)

**Image Resolution:**
- Maximum 1386 x 1036 measurement points
- Normal Resolution model: 100 μm/pixel (at 10 cm)
- High Resolution model: 20 μm/pixel

**Scale:** 0-3000 PU

**Camera Resolution:**
- Measurement camera: 1388 x 1038 (~ 1 436 000) pixels
- Documentation camera: Color, 752 x 580 pixels, up to 1 image per second

**Acquisition Modes:**
- Until stopped, Number of images, Time, Snapshot

**Working Distance:**
- Automatic working distance calculation

**Background Compensation:**
- Automatic background compensation once per second

**Lighting Conditions:**
- Normal, ambient room lighting

**Laser Specifications:**
- Measurement laser: 785 nm, NR: 100 mW, HR: 80 mW
- Class 1 per IEC 60825-1:2007 - Safe to use without eye protection
- Area indicator laser: 650 nm, NR: 7 mW HR: 3 mW,
- Class 1 per IEC 60825-1:2007 - Safe to use without eye protection

**Software:**
- PIMSoft, Windows based, Export options: pdf, avi, xml, binary
- Available in several languages

**PC Connection:**
- 1 x Firewire (IEEE 1394b)

**Dimensions and Weight:**
- Scanner head: 22 x 15 x 20 cm, ~2.4 kg

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