New Generation Optical Wound Monitoring Device

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INTRODUCTION

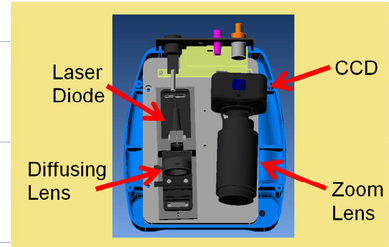
The incidence of diabetes mellitus has tripled in the last decade and more than 20% of the U.S. population are diagnosed as diabetic or pre-diabetic. Diabetics often present with non-healing wounds of the lower extremities. Nearly 50% of these patients eventually require amputation. The estimated total diabetes cost in the U.S. in 2002 was $132 billion (American Diabetes Association, 2003). CW Optics has developed an advanced wound-monitoring device based on a patented laser speckle imaging technique to monitor the efficacy of therapeutic treatment of diabetic wounds. The LSI-1000 is small and noninvasive. It allows clinicians to capture images of the wound area, view the microvasculature, and document the computed blood velocity information for future comparison.

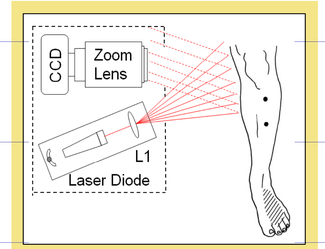
THEORY AND METHOD

- Dynamic speckle forms when living tissue is illuminated by laser light.
- Red blood cell motion produces variation in the laser speckle.
- The LSI-1000 Laser speckle imaging (LSI) uses a charge-coupled device (CCD) to capture the speckle pattern.
- Blood flow velocities are obtained through multiple scattering analysis of the spatial statistics.
- Velocities are color-coded and mapped as a digital image.
- Accuracy is not affected by motion artifacts and skin pigmentation.

LSI-1000

- Quick
- Noninvasive
- Quantitative





RESULTS

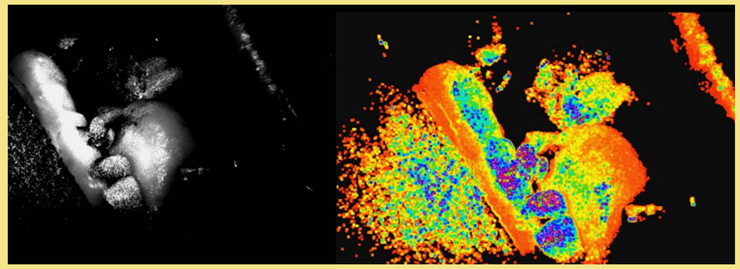


Fig. *1.* Comparison of unprocessed (left) and processed (right)speckle images of a patient undergoing FLAP reconstructive surgery for oral cancer. Velocity increases from blue to red. [1]

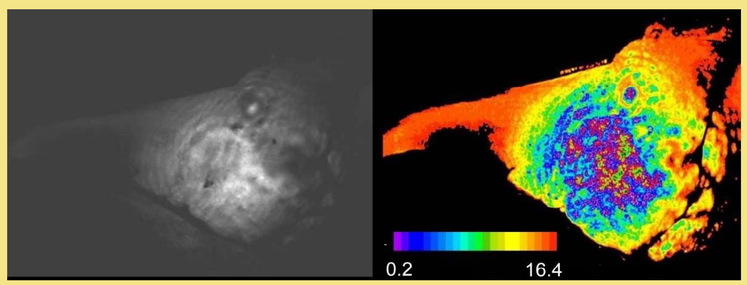


Fig. *2.* Unprocessed (left) and processed (right) speckle images of the latissimus dorsi muscle prior to harvesting for FLAP reconstructive surgery. [2] (unit = mm/s)

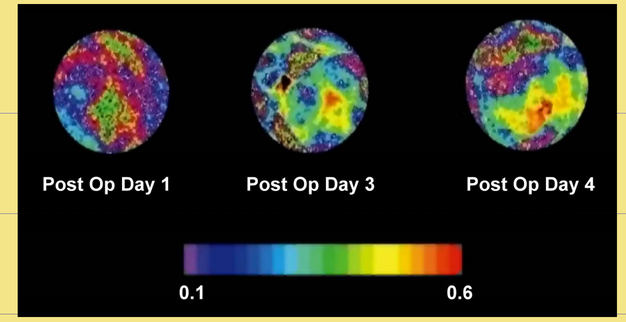


Fig. *3.* Processed speckle images of the flap in Fig. 2 following surgery. A 3-4cm window in the bandage was left specifically for LSI viewing.[2] (unit = mm/s)

CONCLUSION

- LSI-1000 provides accurate and quantitative blood flow velocity information in near realtime, ideal for histological comparisons.
- LSI-1000 captures global images of the area of interest.
- It has proven utility in both retinal blood flow velocity measurements and in perfusion measurements of free FLAP transfers in clinical studies.

REFERENCES

[1] Winchester, L.W. and N.Y. Chou, Measurement of Sublingual Blood Velocity as a Tool for Monitoring Sepsis. IEEE EMBS Conference 2008 p. 3739.
[2] Winchester, L.W. and N.Y. Chou, Monitoring free tissue transfer using laser speckle imaging, Proc. SPIE 6078, 60780G, 2006.

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