Oxygenation imaging during transplant surgery

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Endogenous imaging for surgery

- Image-guided surgery

- Oxygenation: critical parameter
- Spectroscopy can measure oxygenation
- Local probes: [HbO2], [Hb]

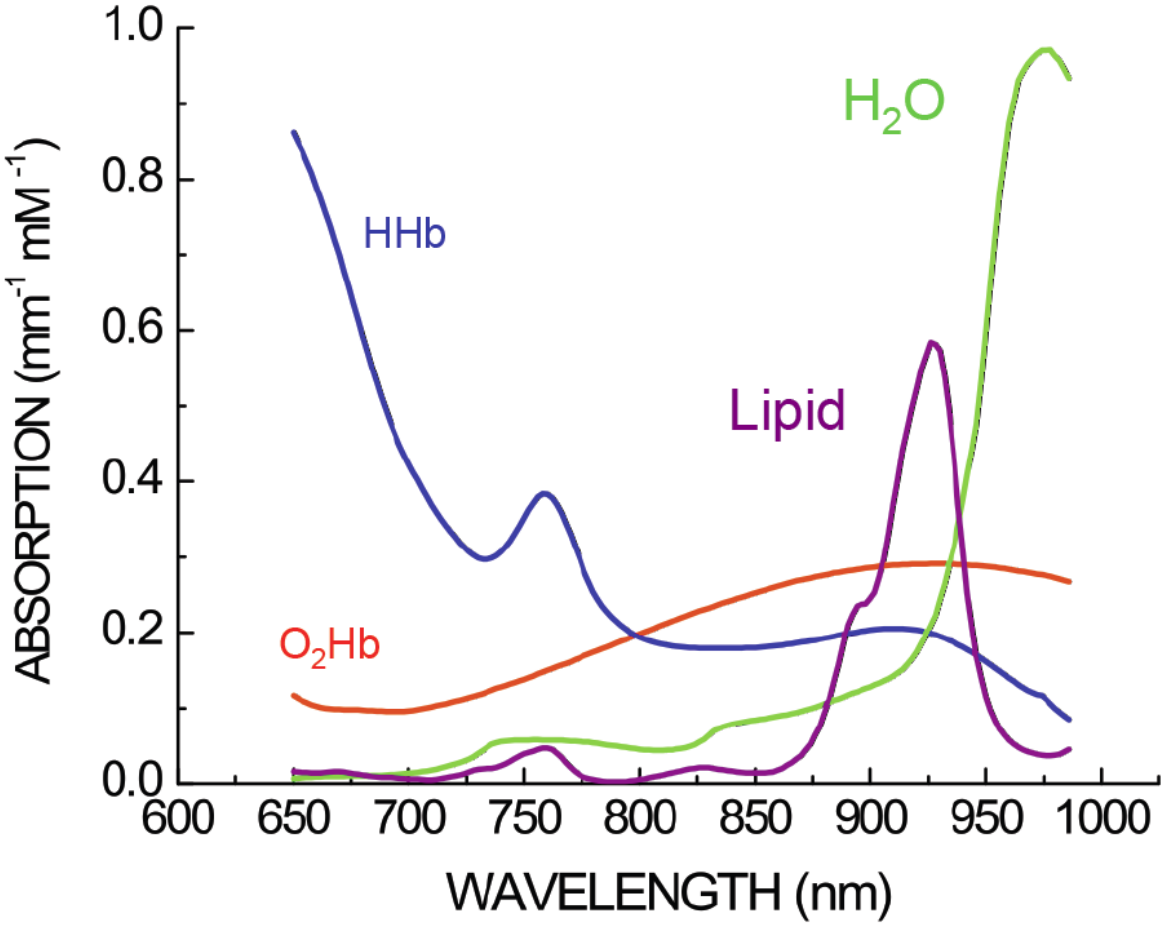
- Clinical need for passive monitoring
- Transplant surgery
- Patient monitoring

Flap transplant surgery

- 15-25% failure rate: ischemia, fat necrosis
- 10-35% complications: re-operations

- Clinical need to improve patient care!

Absorption

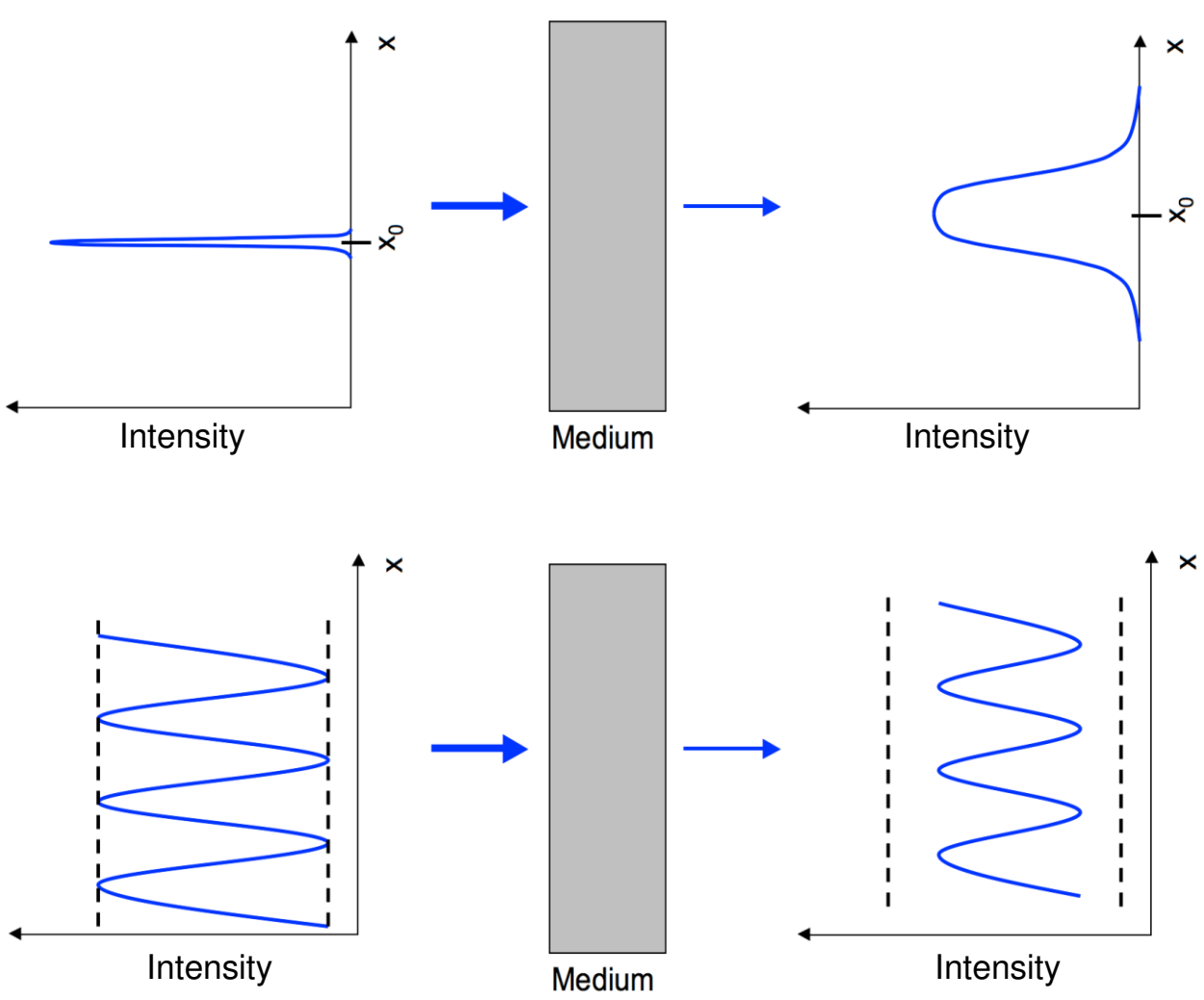


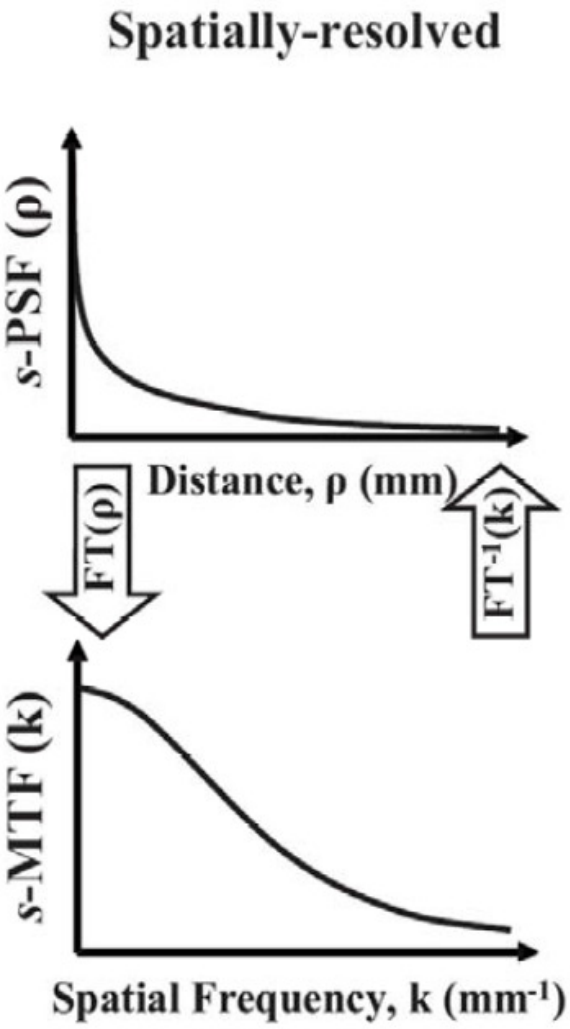
Beer's Law: $$\mu_a(\lambda) = 2.303 \cdot \sum_{i=1}^{N} \varepsilon_i(\lambda) \cdot C_i$$

Real-time oxygenation imaging

- The key is to provide a real-time feedback
- Ideally, absorption and scattering are both measured
- Time domain: not readily adaptable
- Point scanning: slow
- Spatial Frequency Domain Imaging (SFDI)

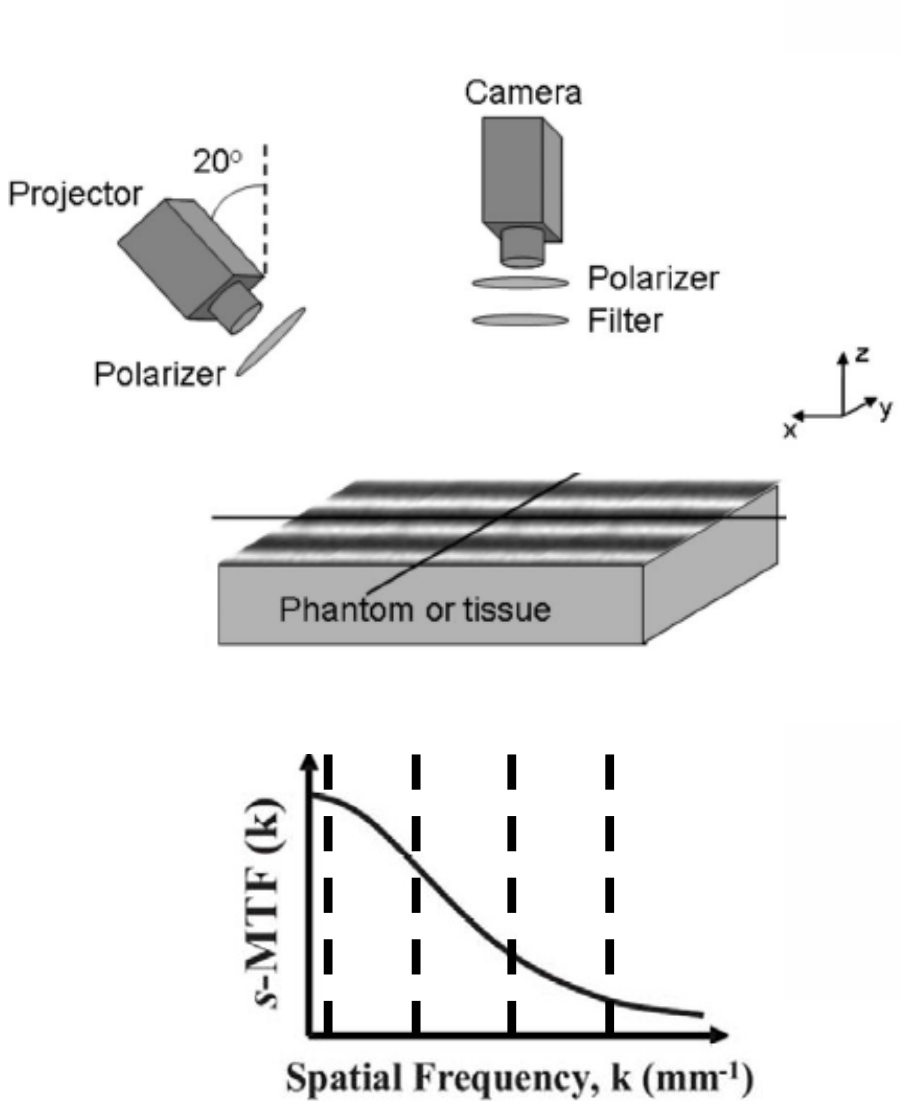
SFDI concept

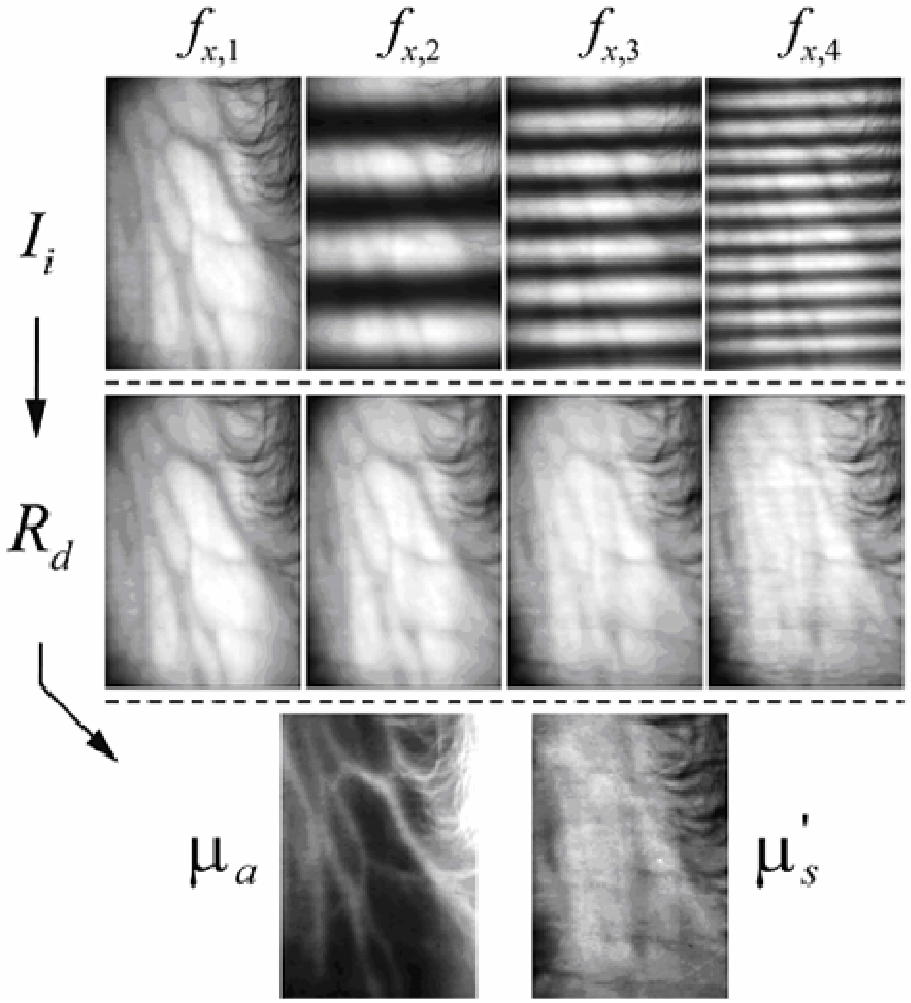




Cuccia et al. JBO. 2009;14(2):024012.

SFDI measurement





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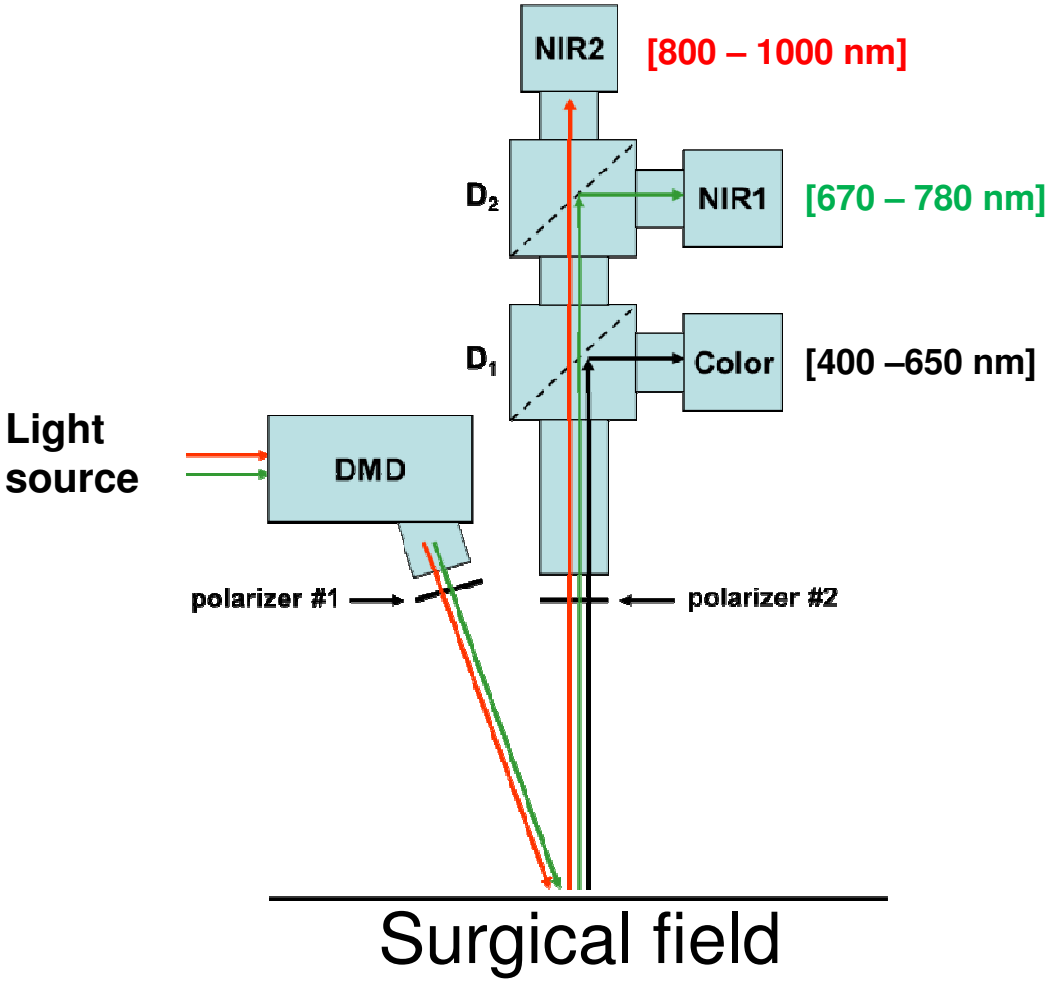
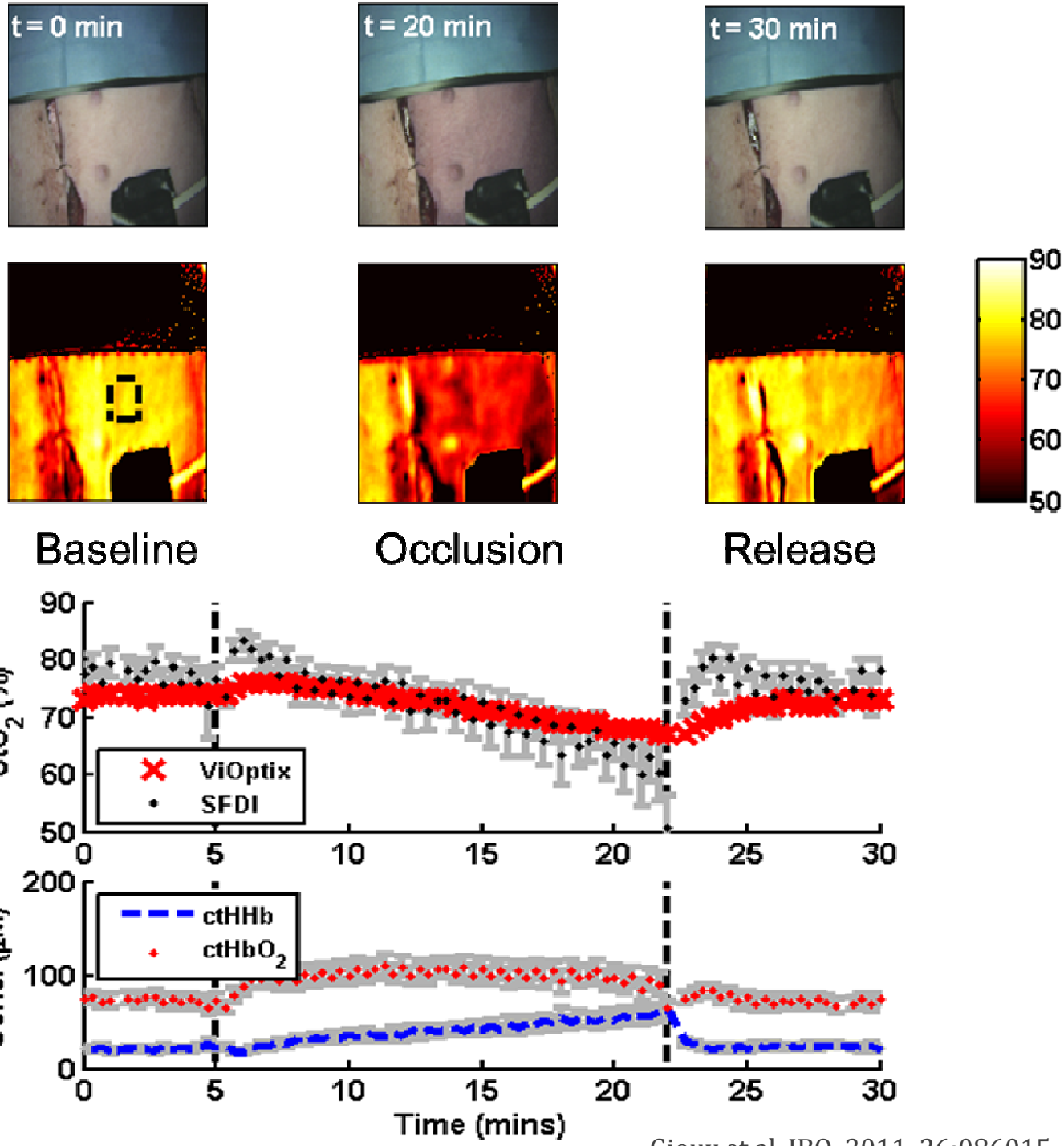
Clinical imaging system



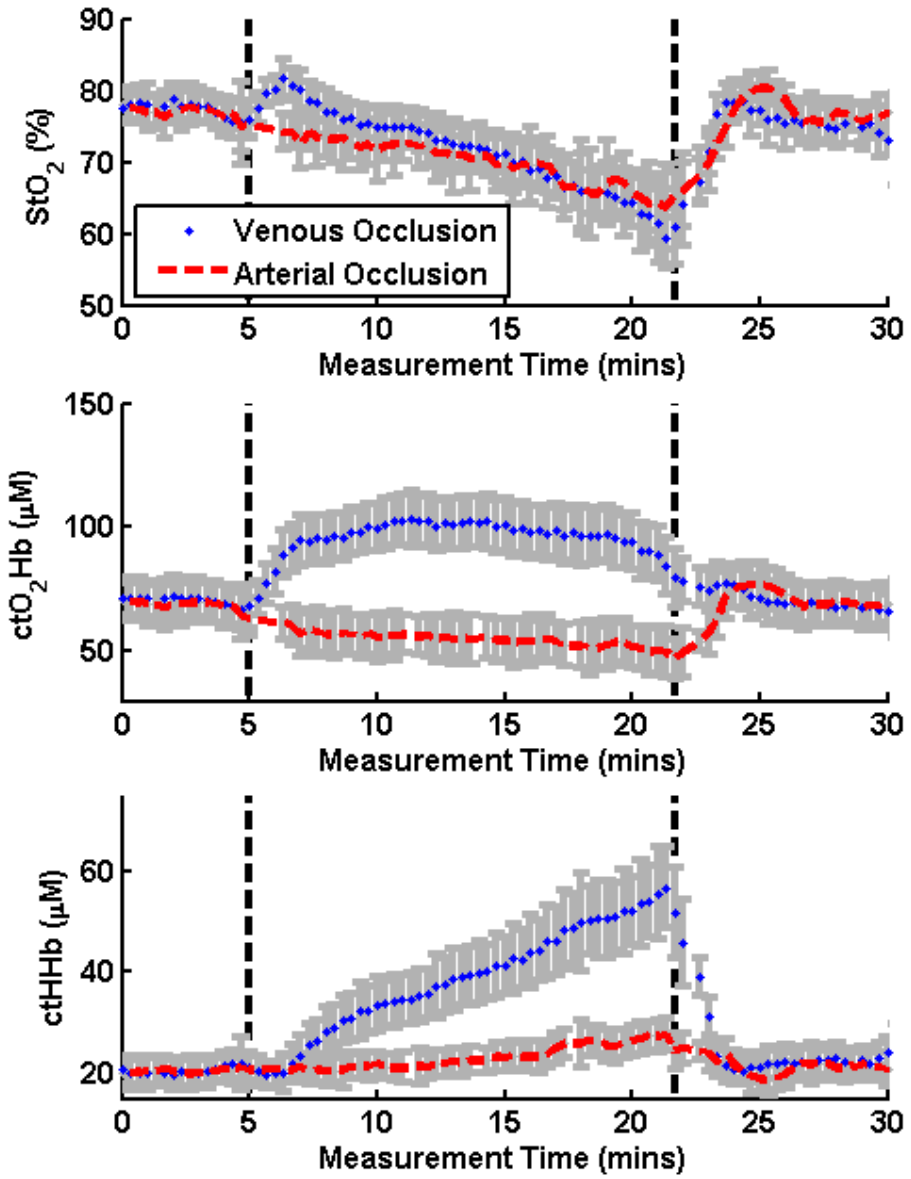
Gioux et al. JBO. 2011. 26:086015.

Vascular occlusion on pigs



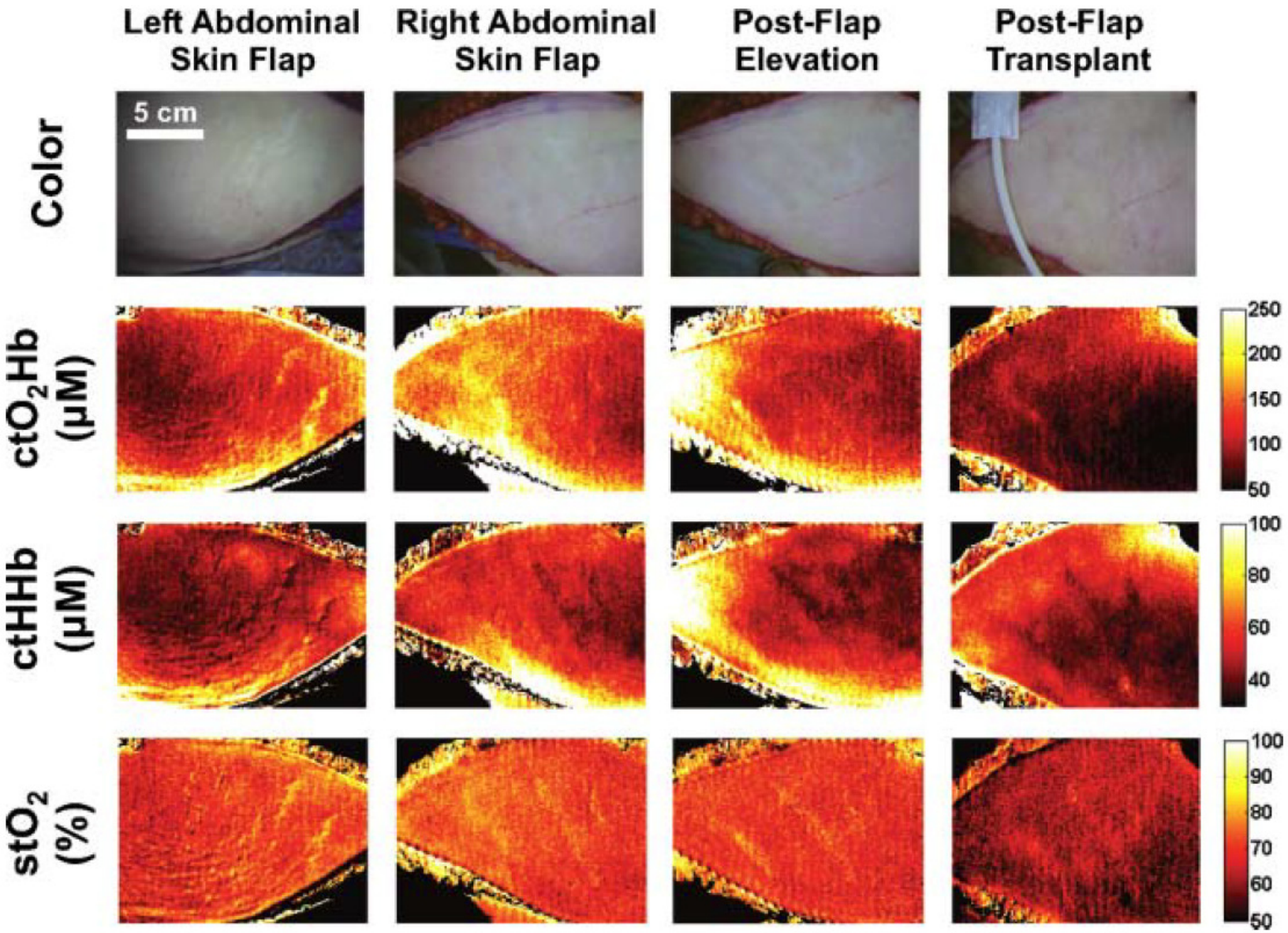
Gioux et al. JBO. 2011. 26:086015.

Arterial vs. venous occlusion



Gioux et al. JBO. 2011. 26:086015.

First-in-human trial



Gioux et al. JBO. 2011. 26:086015.

Intraoperative oxygenation imaging

- The clinical need exists
- The proposed solution is inexpensive
- Patient management seems to benefit

- Towards large trials, and validation

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