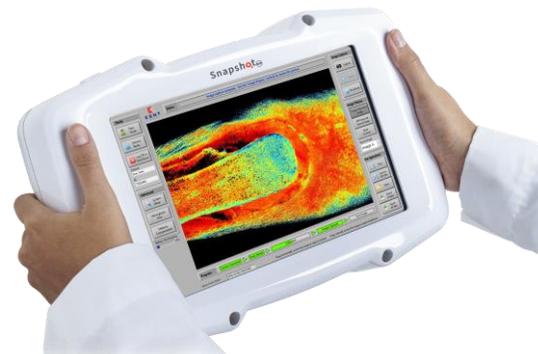


Near Infrared Spectroscopy for Tissue Viability Assessment



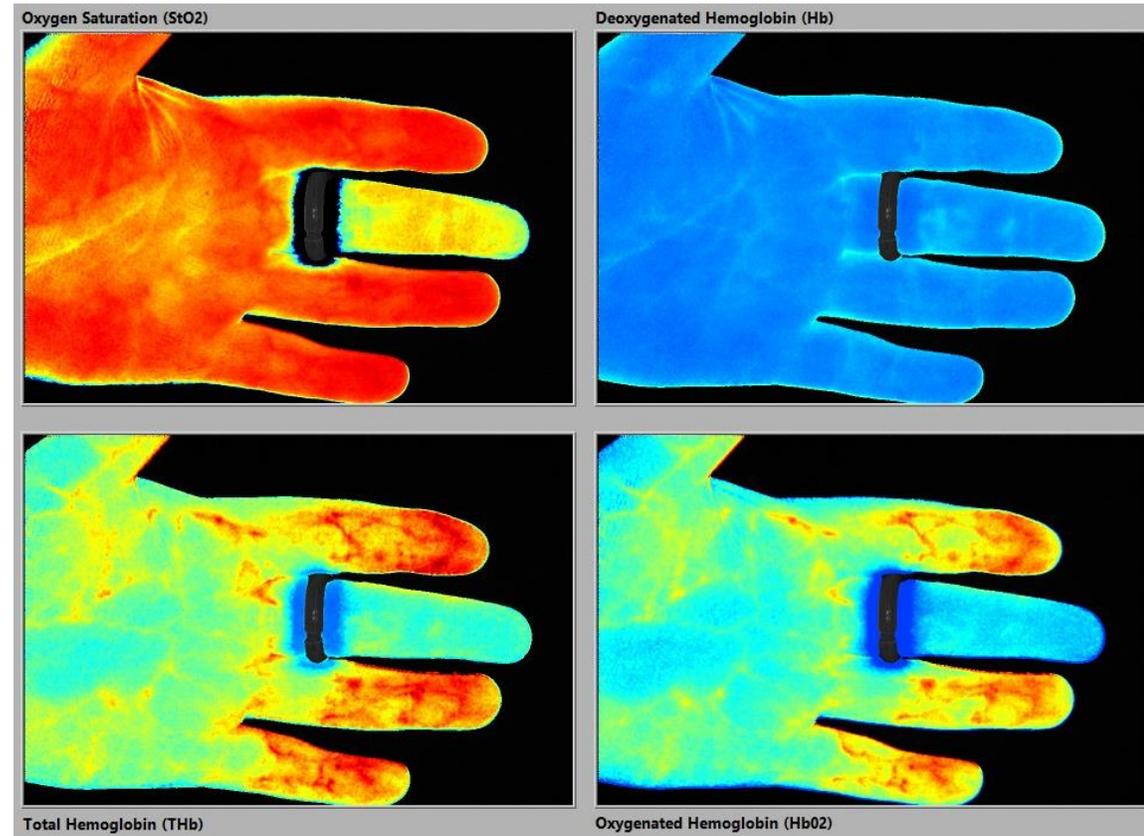
Near Infrared Spectroscopy (NIRS) – External Approach

- NIRS measures tissue oxygen saturation (S_tO_2) in superficial tissue beds.
- Technologies can either be completely non-contact (e.g. SnapshotNIR, Kent Imaging) or require contact with the skin (e.g. IntraOx, Vioptix).
- Used to assess tissue health in a low risk, non-invasive manner.



Tissue Oxygenation

- S_tO_2 is computed by measuring oxy and deoxy hemoglobin.
- S_tO_2 is most closely related to mixed venous – arterial hemoglobin oxygen saturation in the capillary beds.
- **Pulse oximetry** measures a saturation (S_pO_2) that is related to arterial oxygen saturation.
- Tissue oxygenation is not the same as arterial!



NIR Spectroscopy, External Applications

- The technology is used in many different applications including:
 - Breast Reconstruction
 - Soft tissue reconstruction
 - Limb Salvage
 - Revascularization procedures
- Used to assess if superficial tissue is at risk of ischemia. Portable and can be used in many different hospital settings.

NIRS in Amputations

- Patient with gangrenous toe had an amputation
- Flap shows area of concern with NIRS.
- Flap did fail and patient went on to have a trans met amputation
- Transmet flap had area of dehiscence.
- Both complications were predicted in the NIRS images

Post Great Toe Amputation



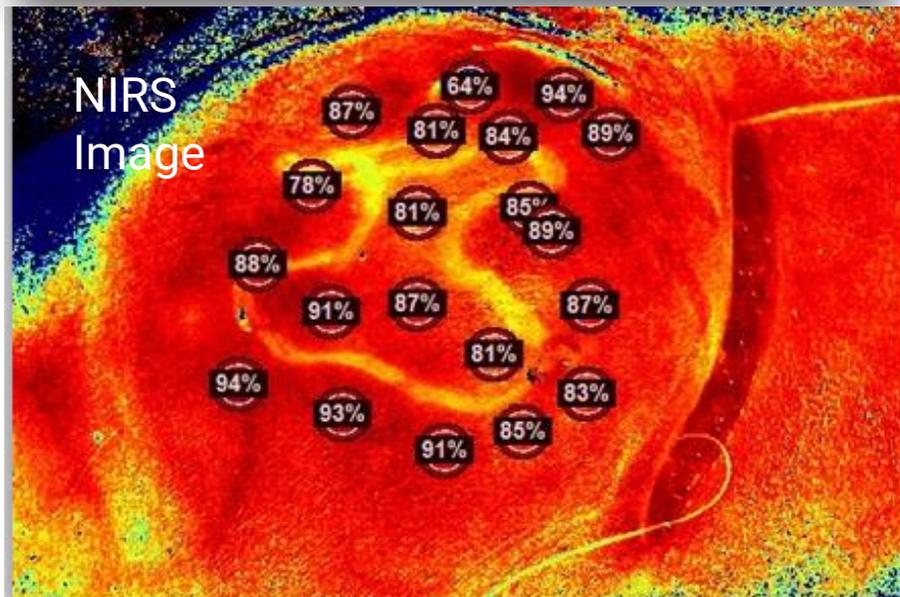
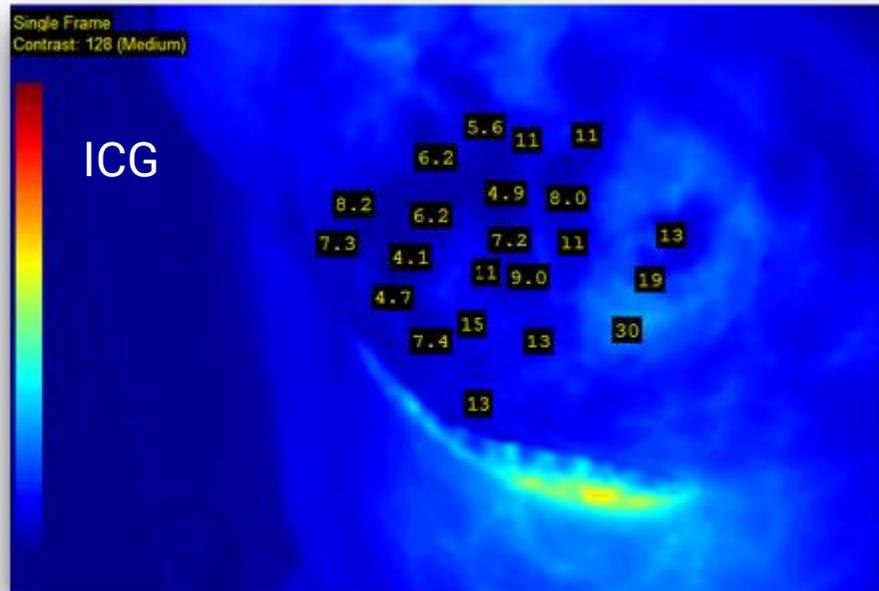
Post Transmet Amputation



Alternative Technology – Indocyanine Green Angiography (ICG)

- Used to visualize the flow of blood in superficial tissue.
- Requires intravenous injection of ICG dye and then a video imaging sequence
- Similar applications to NIRS: Breast reconstruction and Flaps
- More invasive than external NIRS

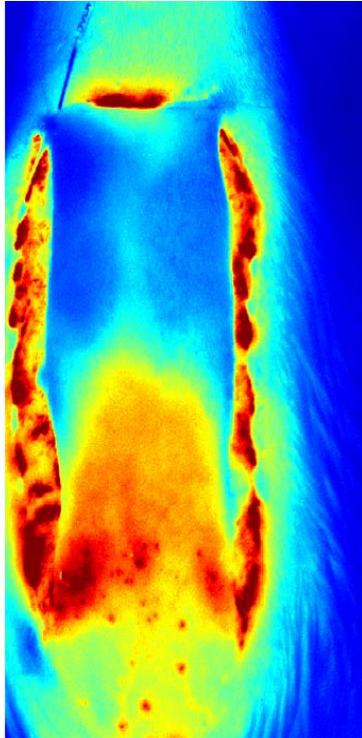
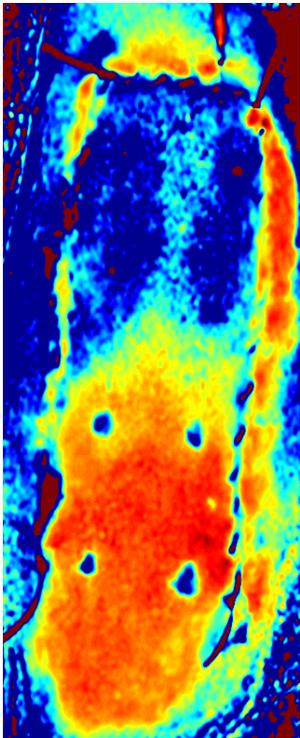
Breast Reconstruction



- ICG predicted tissue necrosis
- NIRS imaging predicted survival
- Tissue survival shown at 1 week post-op

ICG Technology Compared to NIR Technology

	Sensitivity	Specificity
ICG Fluorescence	82.2%	90%
NIR Spectroscopy	88.4%	90%



5 min post flap raise and suture

72 hrs

NIRS Imaging

ICG

Summary

- NIRS with an external approach is a safe, non-invasive way to measure and monitor tissue at risk of ischemia.
- Current codes do not accurately describe this procedure.
- A code to report the use of external NIRS is needed!