

## Introduction and Background

- Preoperative infection management is crucial for reducing complications in chronic complex wound reconstruction, yet this often requires a multidisciplinary approach.
- Even extremely complex patients can be safely taken to reconstruction when infection and bacterial bioburden are managed objectively.
- Traditional infection assessment methods (e.g. wound swabs and biopsies) can take days to acquire results, thereby delaying intervention.
- Fluorescence imaging enables real-time, objective bacterial detection for faster and targeted infection control, potentially enhancing presurgical preparation, improving outcomes and shortening time to reconstruction [1-3].

This case series aims to show how **fluorescence imaging can improve pre-operative infection control, wound bed preparation, and clinical decision marking ahead of complex, multidisciplinary surgical reconstructions via skin substitute application.**

## Material and Methods

- A fluorescence imaging device (MolecuLight i:X) was utilized pre-, intra- and post-operatively during complex wound cases involving surgical debridement, reconstruction, and skin substitute placement.
- Positive fluorescence indicated the presence of pathogenic bacterial loads  $>10^4$  CFU/g. Red fluorescence indicates Gram +/- bacteria and cyan fluorescence indicates *Pseudomonas aeruginosa*, while skin/slough fluoresce green.


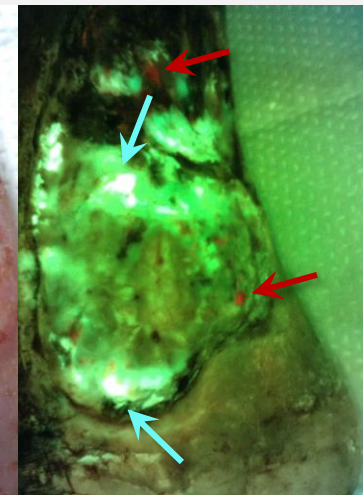
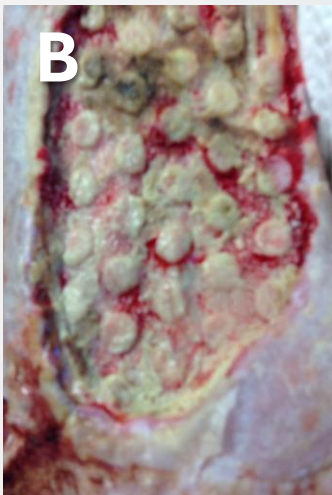
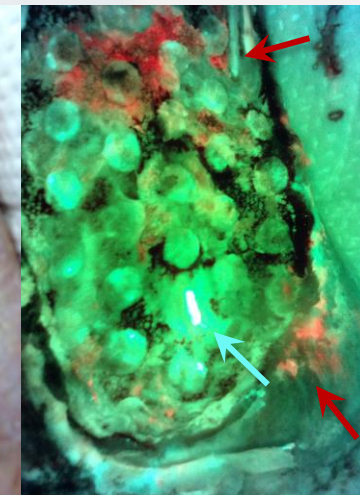
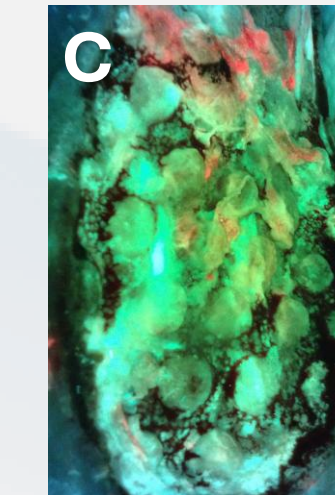
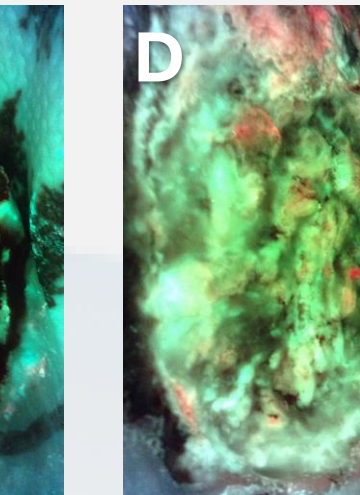
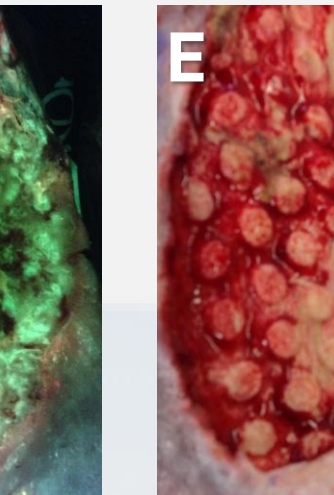




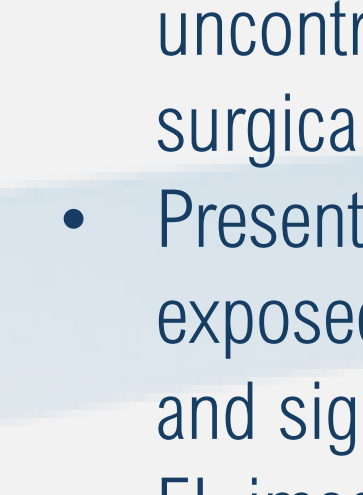


## Conclusions

- Pre-operative fluorescence imaging optimized wound bed preparation in the hospital inpatient setting, expediting surgical readiness and improving outcomes in complex skin substitute placement.
- Fluorescence imaging was involved in key decision points, including:











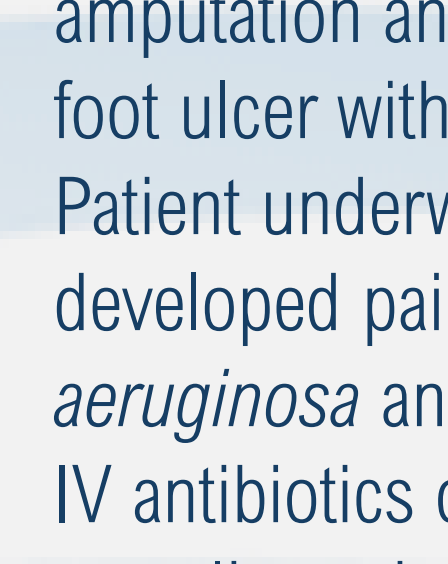
## Case 1 – Multiple Chronic Lower Extremity Ulcerations

Initial Visit		3 Days		7 Days		9 Days		24 Days		Intra-Op	
											
<b>Wound 1</b>		<b>Wound 2</b>		<b>Wound 3</b>		<b>Wound 4</b>		<b>Wound 5</b>		<b>Wound 6</b>	
Upon admission, cyan (A, F) and red/yellow (A, F) fluorescence signals (arrows) were observed along with abundant slough and necrotic tissue debris.		Following 3-days of NPWT, a heavy amount of bioburden speculated, as fluorescence imaging uncovers persistent red and cyan signals. Wound VAC with instillation applied.		Red/cyan fluorescence decreasing (C-D, H-I). I&D required, but popliteal artery aneurysm perforated. New NPWT with instillation was applied while waiting for vascular bypass.		Post-bypass and revascularization, fluorescence-guided debridement significantly reduced bacterial burden as shown by decreased fluorescence signals (E,J).				With bacterial burden minimized, SomaGen meshed allograft and Salera mini membranes were applied to all wounds.	

- 63 y.o. male with a history of peripheral arterial disease, venous insufficiency with ulceration, hypertension, hyperlipidemia, and uncontrolled type 2 diabetes, and multiple recurrent ulcers requiring surgical debridement with reconstruction.
- Presented with 5 active lower extremity ulcerations (>2 years) with exposed tendon on right lower extremity with pain, heavy slough/exudate and signs of infection.
- FL imaging showed red and cyan FL signals, confirmed by wound culture for *P. aeruginosa* and heavy growth of mixed morphologies.
- Requires vascular surgery to improve blood flow, NPWT with instillation, and reconstruction with skin substitutes.

**Case Summary:** In a complex patient involving multiple lower extremity ulcerations, pre-operative fluorescence imaging identified persistent red and cyan signals indicative of bioburden/biofilm, guiding timing of wound reconstruction. Intra-operative fluorescence imaging guided targeted debridement, leading to improved wound bed preparation for CAMP application.

## Case 2 – Infectious Complications Following a Transmetatarsal Amputation

Pre-Op			Intra-Op			Post-Op		
								
<b>Initial Visit</b>			<b>8 days later</b>			<b>Post-Op</b>		
Along with clinical symptoms of infection (A), red and cyan FL signals were pre-operatively observed on the wound bed and periwound (B). Intra-operative fluorescence-guided surgical debridement reduced FL signals (C). NPWT was applied post-operatively (D), yet red FL on the periwound persisted (E).			8 days post-surgery, pre-operative assessment revealed excessive bleeding and oozing (F) and persistent red and cyan FL signals (G). Intra-operative FL-guided debridement was conducted (H), but FL was not completely eliminated (I). Guided debridement continued until almost all FL was removed (J-K).			With bacterial burden minimized, SomaGen meshed allograft and Salera mini membranes were applied.		

- 64 y.o. female with a history of hypertension, hyperlipidemia, hypothyroidism, and type-2 diabetes underwent a transmetatarsal amputation and revascularization of the left foot secondary to a diabetic foot ulcer with abscess, gangrene and osteomyelitis.
- Patient underwent weekly surgical debridement, HBOT, and NPWT, but developed pain, abscess, and cellulitis confirmed by wound culture for *P. aeruginosa* and *Corynebacterium sp.*
- IV antibiotics ordered but not administered due to resourcing and patient compliance issues. Left foot worsened with pain, erythema, and abscess.
- Requires NPWT with instillation, and reconstruction with skin substitutes.

**Case Summary:** Despite standard of care treatments and surgical debridements, this post-amputation wound continued to deteriorate. Pre-operative fluorescence imaging revealed persistent bioburden/biofilm that was likely overlooked with conventional methods. These fluorescence signals were effectively reduced with intra-operative fluorescence-targeted debridement, leading to optimal wound bed preparation for CAMP application.