

# CASE STUDY USING CONTINUOUS DIFFUSION OF OXYGEN THERAPY (CDO) ON THREE PATIENTS WITH TRANSMETATARSAL AMPUTATION WOUND DEHISCENCE

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## INTRODUCTION

Diabetic and/or peripheral arterial disease patients requiring transmetatarsal amputations (TMA) can be challenging. Complication rates for this procedure can be as high as 88%. (1). These patients often present with multiple comorbidities which impair wound healing. Continuous Diffusion of Oxygen therapy (CDO) is a non-invasive, cost-effective treatment modality (2) that has been applied with success to promote wound healing in a variety of conditions (3).

## METHODS

Three patients who require a transmetatarsal amputation were implemented on continuous diffusion of oxygen therapy and/or hyperbaric oxygen therapy. The device used allows for titration of oxygen flow rate to manage pain and drainage. Each patient was started at 9ml/hr. of oxygen diffusion. Every 1-2 weeks, the rate was increased by 3 ml/hr. until 15 ml/hr. was achieved.

## DAY 0 – DATE OF TRANSMETATARSAL AMPUTATION

Weekly measurements, near infrared spectroscopy and fluorescence wound imaging data were collected. The wounds were monitored over time for healing progress, pain/discomfort, tissue oxygenation, and overall patient satisfaction.

## CASE STUDIES

**PATIENT 1** - The patient is a 47 year old male with a significant past medical history: • Hypertension  
• Dyslipidemia  
• Diabetes mellitus type 2 (uncontrolled) with complications of diabetic neuropathy and peripheral vascular disease

DAY 0 - Transmetatarsal amputation Right foot

**PATIENT 2** - The patient is a 62 year old male with a significant past medical history: • Chronic inflammatory demyelinating polyneuropathy,  
• Pulmonary embolism/deep vein thrombosis  
• Diabetes mellitus type 2 (uncontrolled) with complications of diabetic ketoacidosis, diabetic foot ulcerations, neuropathy, vascular disease and nephropathy.

DAY 0 - Revision transmetatarsal amputation

*The patient was treated both with hyperbaric oxygen therapy and continuous diffusion of oxygen*

**PATIENT 3** - The patient is 69 year old male with significant past medical history: • Peripheral arterial disease  
• Chronic venous insufficiency  
• End stage renal disease  
• Heart failure with reduced ejection fraction

DAY 0 - RIGHT transmetatarsal amputation

*The patient was treated both with hyperbaric oxygen therapy and continuous diffusion of oxygen*

## RESULTS

Both patient 1 and 2 have healed with continuous diffusion of oxygen. Patient 3 is close to healing. All patients found the continuous diffusion of oxygen easy to learn and maintain. There were no adverse effects.

Patients 2 and 3 also received hyperbaric oxygen therapy; patient 2 for diabetic foot ulceration Wagner grade IV and patient 3 for an acute arterial insufficiency.

Near infrared spectroscopy confirmed reduction of inflammation and hyperemia.

## DISCUSSION

More studies and cases need to be completed to evaluate the effectiveness of CDOT on more patients in this population. CDOT showed noted progression to healing in each of the three TMAs. CDOT was used as an adjunct therapy in each case with HBO. NPWT was used on patient 2, before a revision was required due to infection and dehiscence. With recent data on CDOT and incisions, this may be a preferred option for incision management prophylactically. CDO therapy has been shown in studies to increase and organize collagen (4,5,6,7), reduce pain (8), increase angiogenesis (9,10), and increase perfusion (11). Incisions require strength of tissue and perfusion to prevent complications. Research has shown CDOT to have a trend in positive outcomes in perfusion and improved outcomes in diabetic amputations (Interim results published as a poster at the 23rd Congress of the Michael E DeBakey International Surgical Society). The abundance of recent research, recommendations from organizations, and my experience suggest that CDO is a great adjunctive therapy to manage wound dehiscence as well as other types of wounds.

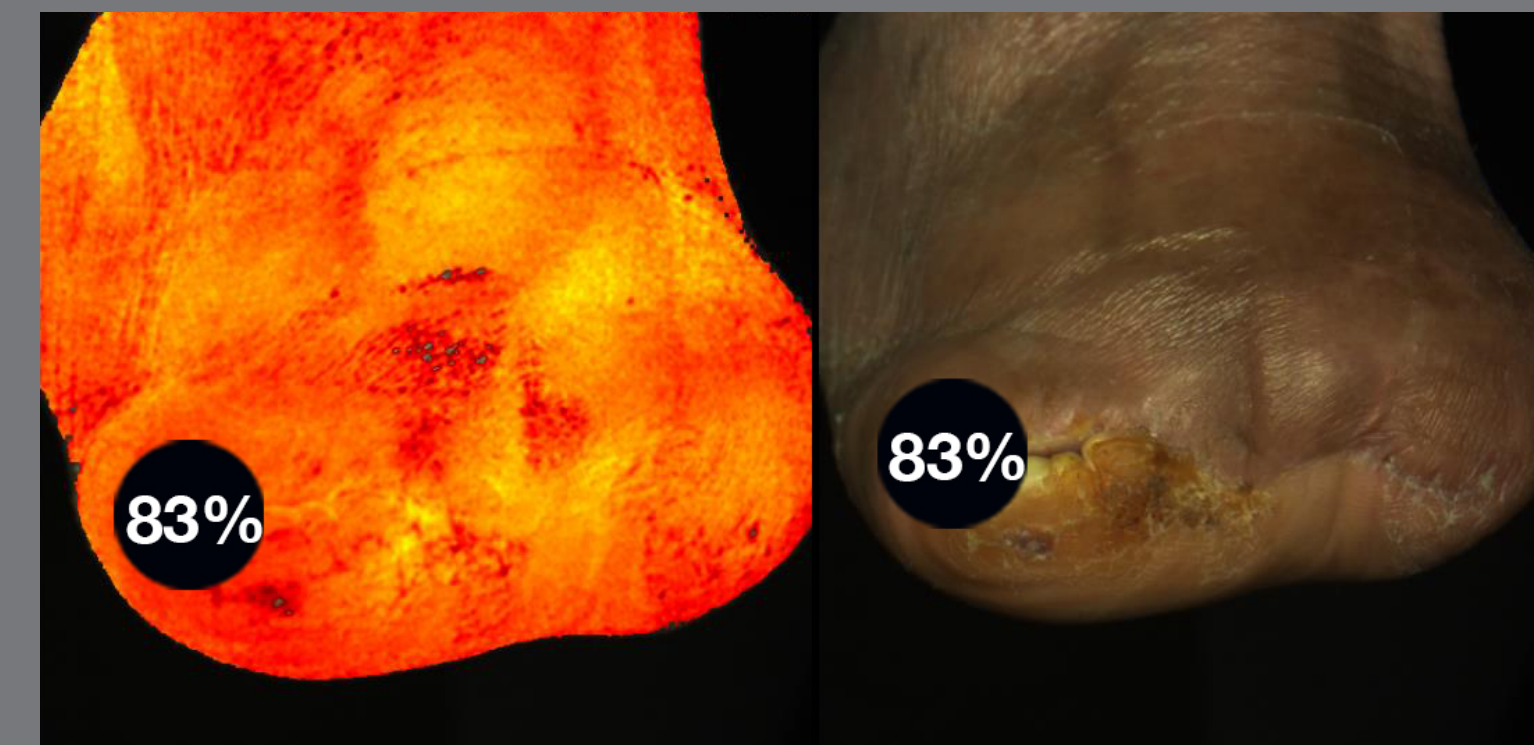
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## PATIENT 1

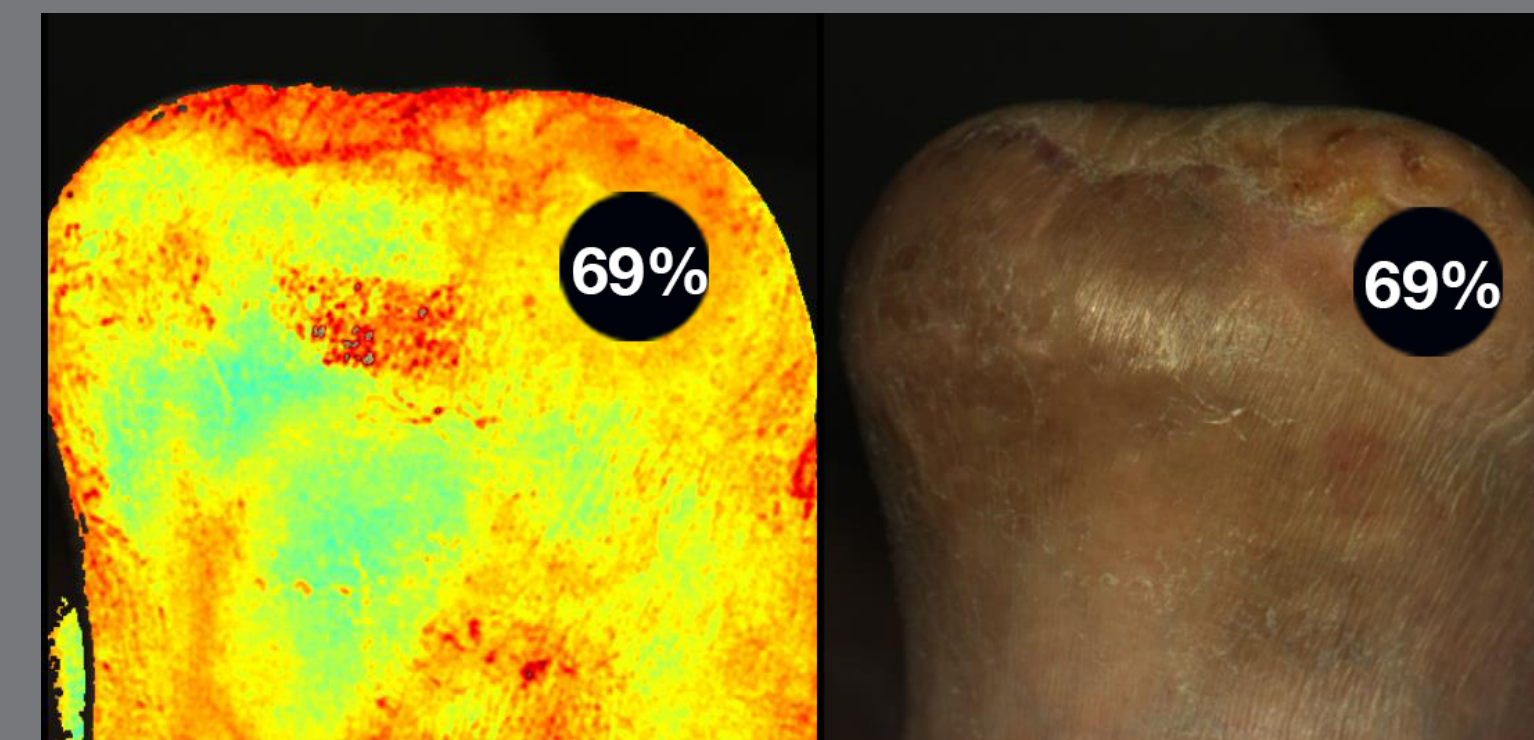
DAY 0

Transmetatarsal amputation right foot

Day 79



Day 106



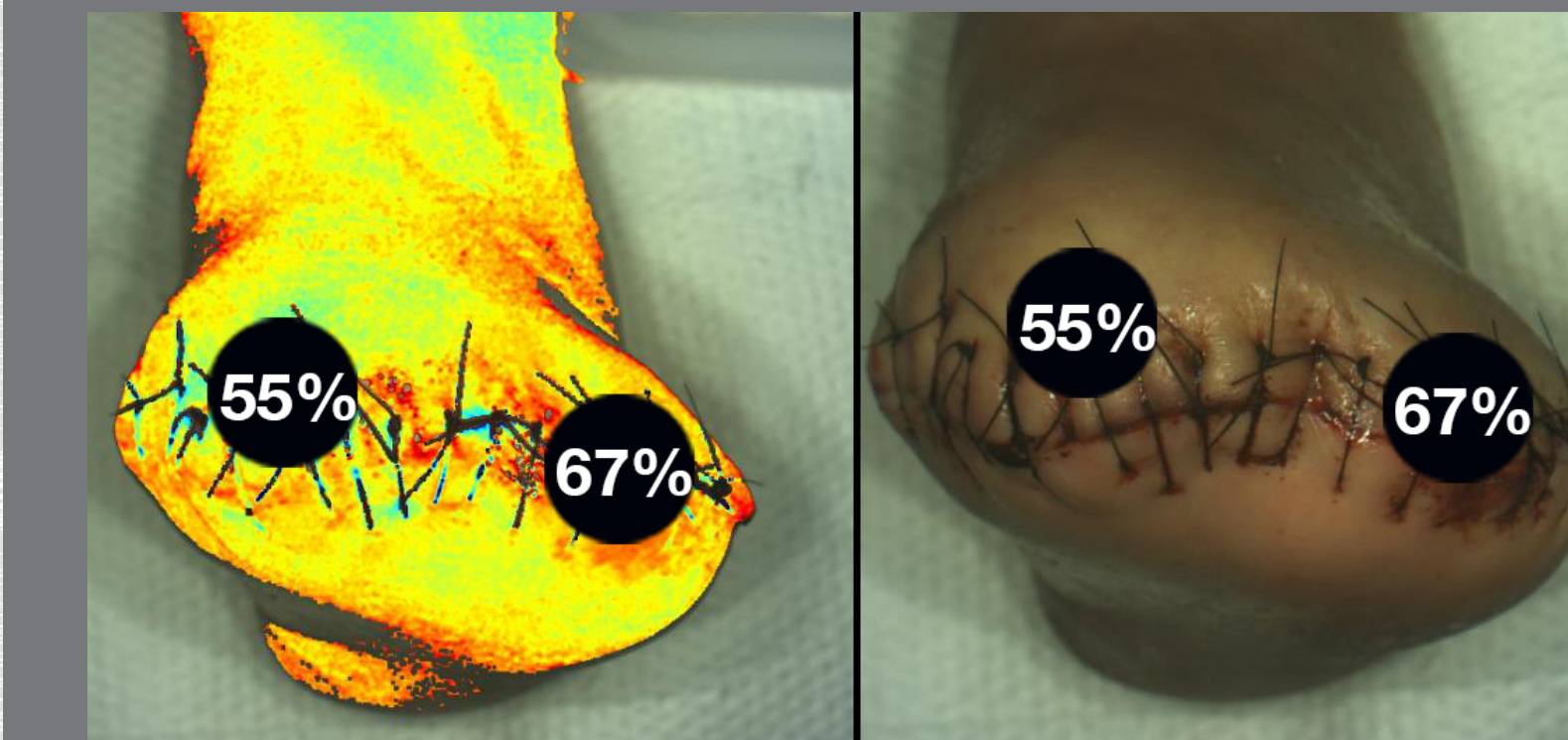
Healed

## PATIENT 2

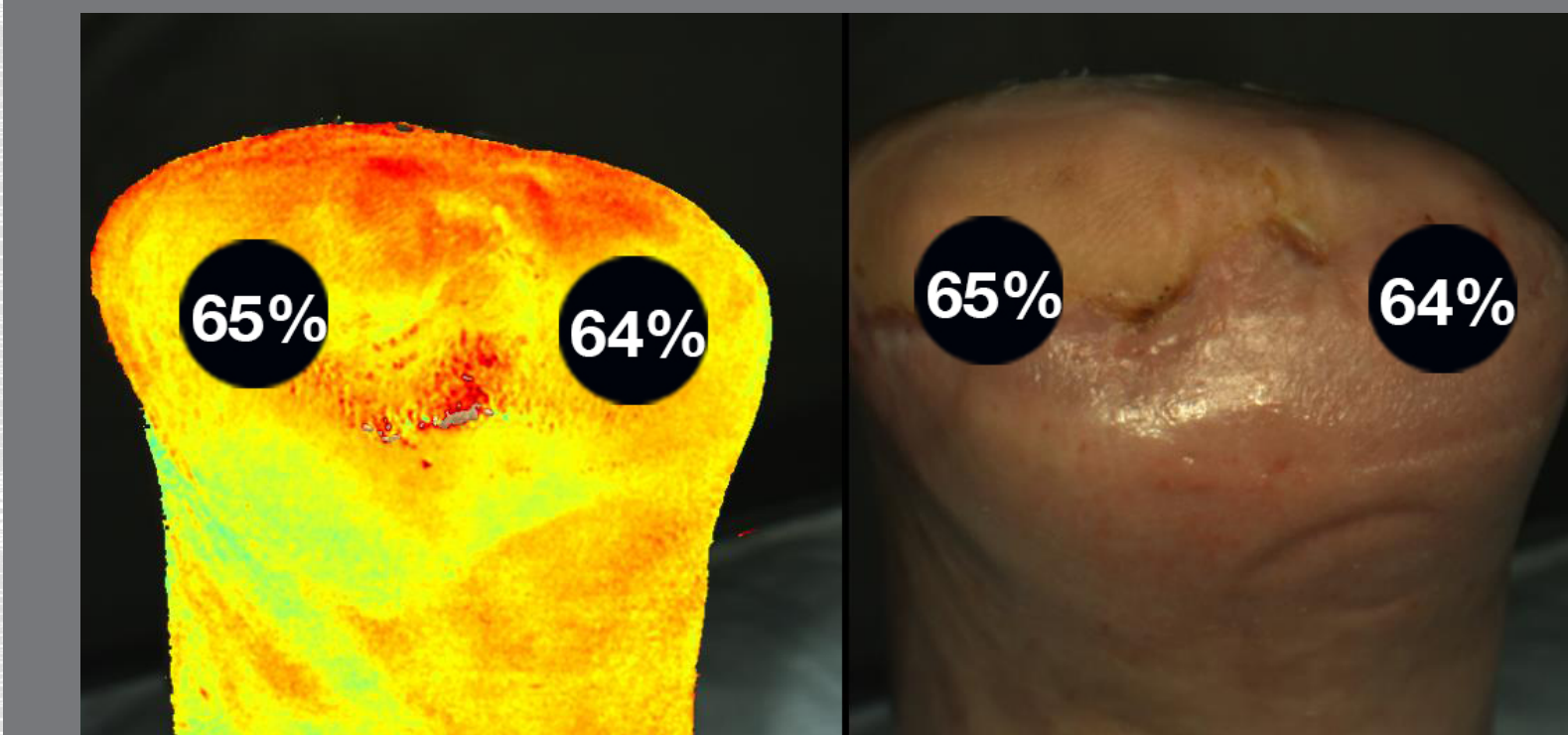
DAY 0

Revision transmetatarsal amputation

Day 0



Day 92



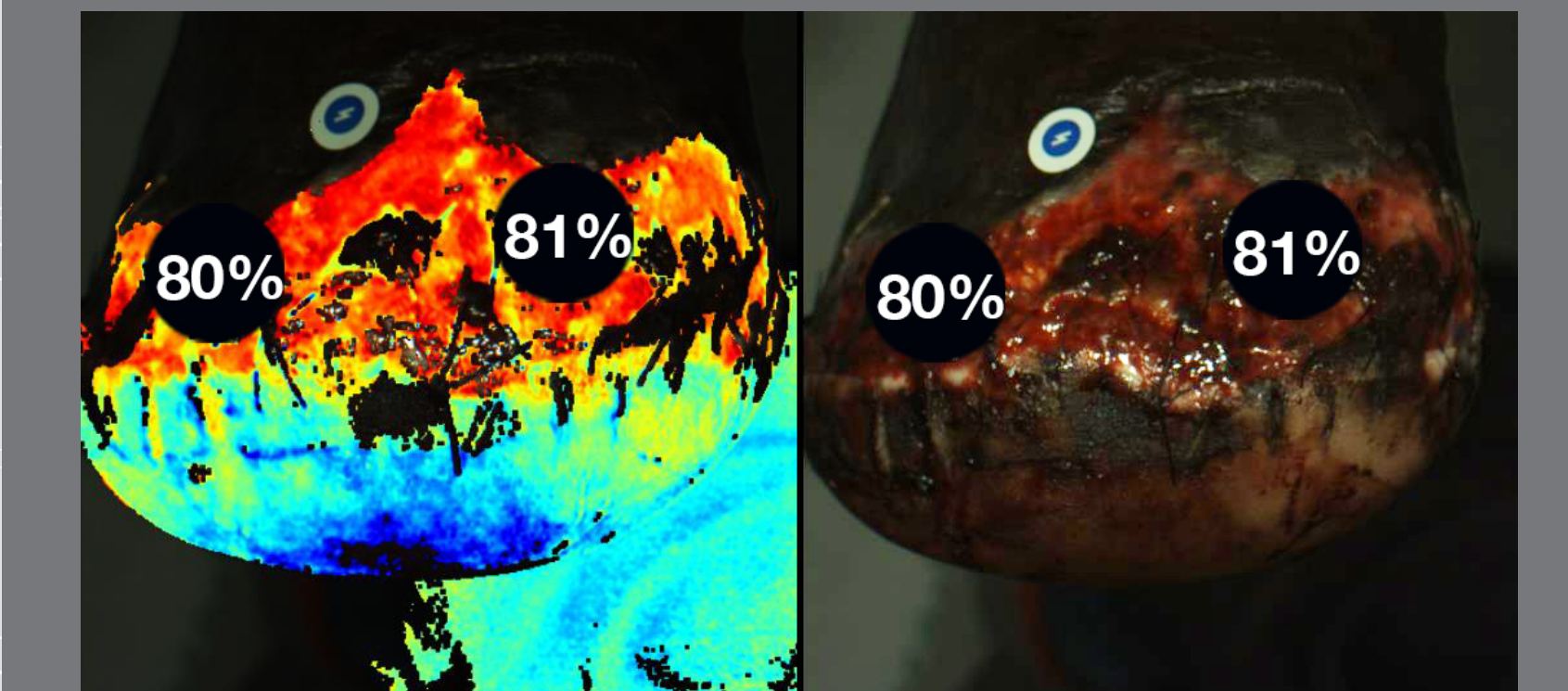
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## PATIENT 3

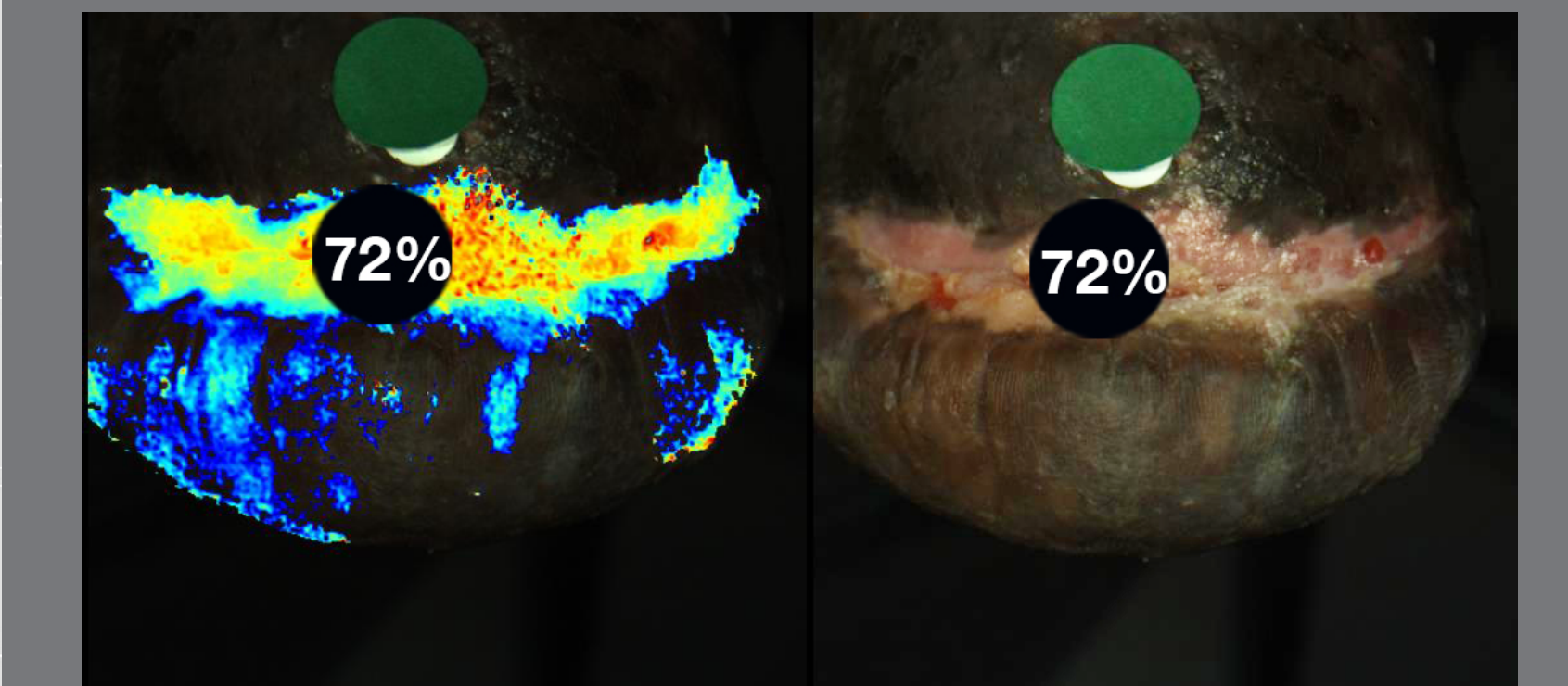
DAY 0

Right transmetatarsal amputation

Day 24



Day 123



Nearly Healed



## REFERENCES:

