

# CASE REPORT: UTILIZING A DISINFECTION TECHNOLOGY TO ASSIST IN HEALING RESIDUAL LIMB WOUND

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## 01 INTRODUCTION

Approximately 2.7 million people in the United States are living with limb loss, and that number is expected to double by 2050<sup>1</sup>. Up to 73.8% of prosthesis users report skin problems on the residual limb, including skin irritation, redness, and itchiness along with severe odor, which is frequently associated with heating, sweating, and bacterial infection<sup>2</sup>. These skin problems are considered a significant secondary health concern for prosthesis users<sup>3</sup>.

Importantly, prosthesis-related skin problems, perspiration, odor, and bacterial infections are all closely linked<sup>4</sup>. Such problems are not limited to amputees. Patients who use lower extremity orthoses, particularly those with diabetes, are also vulnerable<sup>5</sup>.

The current recommendations for maintaining proper hygiene to reduce such skin problems include daily washing and sanitization of prosthesis liner and skin stump. However, nearly

25% of prosthesis users do not comply with the hygiene guidelines, even failing to wash skin stumps regularly<sup>4</sup>.

Because of the risks associated with infection and the challenges of maintaining adequate hygiene compliance, a simple, repeatable process for effectively disinfecting patient devices is necessary. The Bluewave Disinfection Device is a vacuum infusion technology that utilizes high concentrations of ozone gas to kill microbes on both hard and soft surfaces.

This Case Report examines the use of the Bluewave Device to treat the prosthetic liners of a Veteran amputee who had an open, active bacterial infection on his residual limb. The aim is to provide clinicians information on improving wound-healing outcomes for high-risk patients suffering from recurrent or chronic infection and other device-related challenges arising from inadequate device hygiene.

## 02 CASE PRESENTATION

Patient is a 76-year-old Caucasian male, bilateral transtibial amputee with type-II diabetes. He has worn his prostheses for 2 years. Patient presented with an open wound with a bacterial infection diagnosed by his primary care physician. The

wound had been present for 6 months prior to intervention with the Bluewave Device. Antibiotics had been administered by physician during this period but had been unsuccessful in healing the wound.

## 03 MANAGEMENT AND OUTCOME

Immediately upon Patient's presentation in clinic, Clinician used Bluewave Disinfection System to treat the liners used on Patient's infected residual limb. Simultaneous antibiotic treatment was also prescribed by the referring physician.

Subsequent in-clinic treatments followed at 2-week intervals as wound healing progress was assessed. At the first 2-week follow-up after the first treatment, the wound showed noticeable improvement.



Fig. 1 (a) Patient presented with a visibly infected open wound on his left knee. (b) Clinician treated his liner with the Bluewave Device 6 times over the course of 12 weeks to achieve complete healing of the wound.

## 03 MANAGEMENT AND OUTCOME (cont.)

Full wound healing was achieved in 12 weeks (after 6 treatments of the liner in the Bluewave Device), and no residual limb infection has recurred since the implementation of the Bluewave Device for this patient.

## 04 DISCUSSION

The rapid improvement observed after the first treatment of Patient's liner with the Bluewave Disinfection Device indicates that the treatment had a significant beneficial impact on the wound-healing process. Further investigation is warranted to fully establish a causal relationship between use of the Bluewave Device and wound healing or infection-prevention.

While similar data is being collected on the Bluewave Device's use to prevent and eliminate skin infections for babies using cranial remolding orthoses, studying the application on additional devices, such as diabetic shoes, Charcot boots, and other orthoses is also warranted to determine the impact on the issues presented in the Introduction section of this Report.

## 05 CONCLUSION

While infection prevention requires a multi-faceted approach, the Bluewave Device appears to be an efficient, effective solution for disinfecting the devices worn by O&P patients and reducing or eliminating contaminated devices as the source for infection or reinfection with high-risk patients.

## ADDITIONAL CASES

Further case studies are in progress with amputee volunteers. Below are pictures of additional amputees' residual limbs before and after Bluewave intervention.



### References:

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