Disinfection of Needleless Connectors Using UVC Light

Julia Rasooly, MS[1], Niaz Banaei, MD[2], Michael Fourkas, MS[1], Gregory Schears, MD[3]

[1]Puracath Medical, Inc, San Francisco, CA [2]Department of Pathology and Medicine, Stanford University, Stanford, CA [3]Mayo Clinic, Rochester, MN

Purpose

The use of vascular access devices are integral to the management of patients in critical care settings. Unfortunately, one of the most common risks associated with vascular access device is catheter-related infections. We examine the novel use of UV light to disinfect both the surface and interior of needleless connectors commonly found in critical care settings.

In this study, we investigate the efficacy of 1 second of ultraviolet light-C exposure in the reduction of the 3 most common CLABSI associated organisms: *Staphylococcus aureus*, *Candida albicans*, *Candida auris*, and Methicillin-resistant *Staphylococcus aureus* (MRSA).

Background

Nearly 50% of post-insertion catheter-related infections are due to microbial ingress from needleless connectors (NC), widely used devices which connect to the end of catheters or infusion sets and enable access for injection of medications and attachment of infusions. Infections arising from NC could result in central line associated bloodstream infection (CLABSI).

The clinical guideline for disinfecting NC is to wipe the hub of the NC with a 70% alcohol and to manually scrub the connector surface for at least 15 seconds. Unfortunately, multiple studies have found low compliance with the 15 second disinfection scrub.

Results – What Were the Findings?

Table 1. Log reduction of tested organisms after 1 second of UV-C exposure

Test Organism	Positive Control Concentration (cfu/mL)	Log Reduction ± Standard Deviation
Staphylococcus aureus	9.9×10^4	5.68 ± 0.63
Candida albicans	2.5×10^4	5.05 ± 0.61
Candida auris	3.0×10^4	4.41 ± 0.33
Methicillin-resistant Staphylococcus aureus	3.1×10^6	6.38 ± 0.46

Table 1 displays the overall log reduction of tested organisms after 1 second of UV-C exposure. The results are shown for positive control concentration and log reduction for the test organisms Staphylococcus aureus, Candida albicans, Candida auras, and Methicillin-resistant Staphylococcus aureus.

Conclusions

Our findings demonstrate greater than 4 log reduction of common CLABSI-associated organisms with 1 second of UV-C exposure, which we believe would decrease CLABSI rates, increase aseptic technique compliance, and reduce disruption in hospital workflow.

In addition, by injecting inoculum directly inside the needleless connector, we were able to show that disinfection inside the connector can be achieved, which is otherwise not possible with conventional scrubbing techniques.

Future Directions

Further studies will be conducted with other organisms that are commonly associated with hospital-related infections to further solidify the effectiveness of the new UV-transmissive connectors and UV light generating device in hospital settings.

In clinical studies, we hope to demonstrate the effectiveness of UV-C as a better alternative to current practice in the decontamination of needleless connectors for better care and management of vascular access devices.

PURACATH MEDICAL