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Adtec SteriPlas

Cold plasma efficacy for the treatment of surgical site infections

ADTEC HEALTHCARE

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Post-operative wound infections are a serious complication and still an unresolved problem for many patients. In addition to the significantly extended hospitalization and associated cost burden, deep and chronic wound infections are burdened with a high morbidity and mortality rate. Particularly in deep sternal wound infections and driveline infections such as those associated with left ventricular assist devices (LVAD), bacteria embedded within biofilm acts protected against the use of conventional therapies such as antibiotics and the rate of healing is either slowed down or stalled. The rate of antimicrobial resistance is constantly increasing, and the use of new therapies must be considered to combat the rise.

In the process of wound healing, debridement is always a necessary technique for the removal of slough, debris and necrotic tissue but it cannot act alone. The use of a topical antibacterial medical device such as the Adtec SteriPlas has already shown a significant increase in wound healing using a unique physical mode of destruction of bacteria, despite the type of bacteria or if they are protected within biofilm. This cold plasma medical device has already been well documented in clinical trials and publications to offer a safer, reliable and faster treatment method with the benefit of no side effects reported.

What is cold plasma?

Plasma is often referred to as the fourth state of matter (solid, liquid, gas, and plasma). It is formed when energy is applied to a gas creating an energised state. Common forms of plasma that are easily recognisable include lightning and the Northern Lights. Whilst plasmas are typically known for reaching several hundred to even thousand degrees Celsius, cold plasma is well balanced at a desirable temperature of under 40 °C such as that observed with the Adtec SteriPlas. This provides all the antimicrobial benefits of plasma at an appropriate temperature for patient treatments, offering a safe and effective way to destroy bacteria which would otherwise be resistant to antibiotics.

Cold atmospheric plasma (CAP), also known as cold plasma, is a partially ionized gas containing a mixture of important antimicrobial components including photons, ions, electrons, OH-radicals, UV light and reactive oxygen and nitrogen species. The components of CAP work collectively for the destruction of microorganisms.

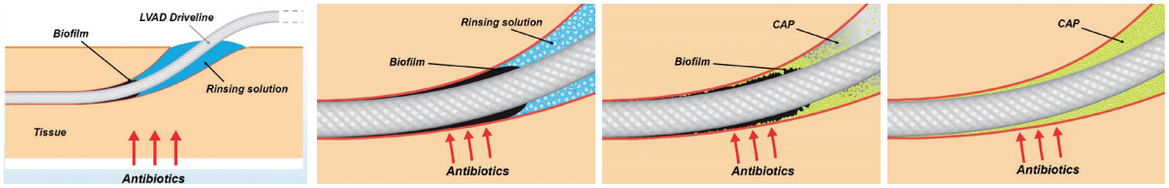
The Adtec SteriPlas is a CE-certified, Class IIb, cold atmospheric plasma medical device with patented components that generates CAP using argon gas. It was the first medical device worldwide in history used to document wound healing efficacy in clinical trial studies which began almost two decades ago, much of which has encouraged further research from various medical device companies and research institutes. The purpose of the Adtec SteriPlas is to manage the infections and conditions in wounds, surgical site infections and dermatological conditions. It has been tested in an array of over 60 clinical studies and peer-reviewed publications and its proven clinical efficacy boasts across a staggering multitude of conditions including arterial and venous wounds, diabetic foot ulcers, deep sternum surgical site infections, infected drivelines, chronic burns, acne, actinic keratoses, herpes zoster and hailey-hailey disease. The main benefits of the Adtec SteriPlas are that there are no side effects reported, proven accelerated healing, only requiring a quick 2 minute treatment time, antibacterial resistance is unlikely to be generated and that it also features a large 12 cm^2 treatment area used to cover a greater surface area of the body than its competitors in a safer and effective way.

The rate of healing in deep sternal wound infections has been significantly increased for patients that have been treated with the Adtec SteriPlas. It has been praised as a tissue and life saving medical device.

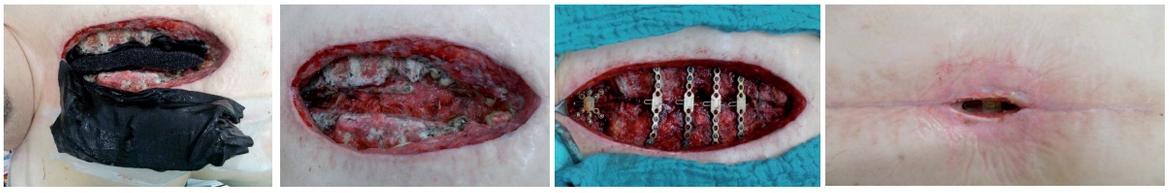
The Adtec SteriPlas creates cold atmospheric plasma which is propelled towards the treatment site. It has successfully shown to destroy multi-resistance bacteria protected within biofilm, all whilst being harmless to mammalian cells.

The Adtec SteriPlas has been well documented for the treatment of deep sternal wound infections and LVADs. Since these problematic conditions already have limited treatment options, the combination of the Adtec SteriPlas with advanced negative pressure wound therapy (aNPWT), an additional underlay of carbon cloth and hypochlorite rinsing solution has shown cases of full healing results without reinfection which could be achieved in as quick as 2 weeks.

Deep sternal wound infections often require delicate and precise treatments to manage these serious infections. Radical wound debridement is usually always required but infections have been shown to persist which complicates treatment options. More importantly if the infection con-



The cold plasma generated from the Adtec SteriPlas is propelled down the gaps in crevices around the infected driveline to reach the biofilm location and destroy any bacteria protected within.



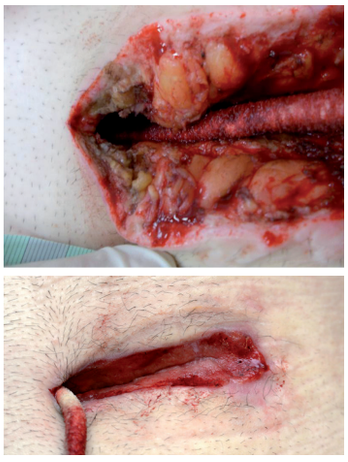
Deep sternum infections treated with the Adtec SteriPlas, carbon cloth underlay, rinsing solutions and advanced negative pressure wound therapy to achieve a mean treatment time (debridement to wound closure) of 16 days.

tinues then the risk of mortality is higher. Similarly, LVAD infections present a high risk. Due to the lack of organ donors, the implantation of LVADs for patients with end stage heart failure is meanwhile the only option to survive. In addition, technology advancements offering LVADs with better hemocompatibility allow patients to have a longer life expectancy on LVADs. Consequently, this longer life expectancy exposes patients to higher rates of long term complications such as chronic infections. Removal of infection in implanted artificial heart systems is not quite so easily performed on the account on the dependency of the system. It is difficult to deliver antibiotics to an exposed cavity not concealed directly within the body and it is also difficult to wrap antimicrobial dressings around the site of the biofilm which is located deep within the cavity. Similarly, rinsing solutions can be offered but there may be difficulty in later removing these substances.

The cold plasma generated from the Adtec SteriPlas can penetrate down the gaps and crevices around the infected driveline towards the site of biofilm and destroy the bacteria present. This destruction of bacteria is later collected with the slough and exudate and remainder of rinsing solution from the suction of the NPWT device.

This unique method of managing the infection of LVADs has shown significant successes in comparison to using standard treatments alone.

Studies conducted by two leading hospitals in Germany (Universitätsklinikum Münster and Universitätsklinikum Heidelberg) have shown promising results using the Adtec SteriPlas to manage the infections in LVADs and deep sternal wound infections which has been documented in publications with leading journals [1–3]. Heinrich Rotering from the Department of Cardiac Surgery at the University Hospital Münster has actively examined a large population study of patients with deep sternal wound infections and infected drivelines in response to treatment with the Adtec SteriPlas.



Before and after Adtec SteriPlas cold plasma treatment. Full healing has been shown to be achieved in as quick as 2 weeks using the Adtec SteriPlas.

In one of his studies between April 2016 to April 2018, 52 patients with deep sternal wound infections were treated with CAP and aNPWT. All of the patients had already failed a therapeutic attempt according to El Oakley classification type IV. As part of his study, all patients received a resistance adjusted antibiotic treatment after initial surgical debridement. Wounds were encouraged to close with the use of a foam with an additional underlay of carbon cloth dressing in the meaning of aNPWT. The wound dressing was changed three times a week with the application of the Adtec SteriPlas each time. To clean the wound before and after CAP application, a rinsing solution containing sodium hypochlorite was used.

The results reveal an accelerated healing response with no relapse of infection. A mean treatment time (debridement to wound closure) was 16 days. This unique combination of the Adtec SteriPlas with aNPWT has been documented as a tissue saving approach without the need of omentum majus or expensive muscle flap plastic surgery. Moreover, this treatment allows to regain complete sternal stability.

References
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