Determination of the reduction of biofilm *in vitro* during wound cleansing using a monofilament debrider* and conventional cotton gauze

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Introduction

Wound debridement and removal of biofilm is a major challenge in the treatment of patients with chronic wounds. Surgical debridement requires trained personal, operation theatre and is often associated with pain but conventional methods relaying on cotton gauze may not be enough. A monofilament debrider* consisting of polyester fibres (figure 1) presents a fast and almost painless option for debridement. Hence, we have investigated the capacity of this monofilament debrider* to remove biofilm *in vitro* and compared it to cotton gauze**.

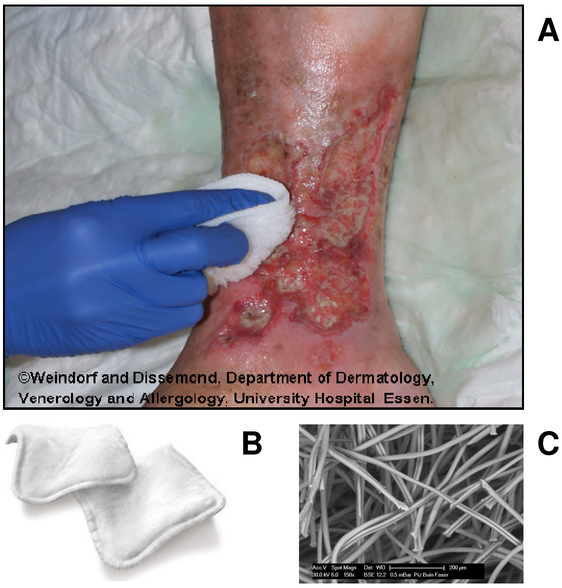

Figure 1: Mechanical debridement (A) with the monofilament debrider* (B). The debrider consists of polyester monofilament fibres (C).

Material & Methods

For the wound debridement model (figure 2), a *S.aureus* biofilm is cultivated on glass plates (figure 3). The monofilament debrider* and conventional cotton gauze** were used to debride/clean the glass plates under standardized conditions ($p=0.067 N/cm^2$, $v=1.6 cm/s$). Afterwards, the glass plates were stained with crystal violet to visualize the bacteria residuals. Plate images were obtained and all images were processed using ImageJ 1.45m (NIH, Bethesda, Maryland, U.S.).

*Debrisoft®, Lohmann & Rauscher **cotton gauze pads, Fuhrmann

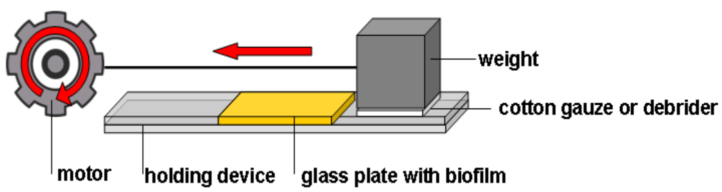

Figure 2: The wound debridment model: Glass plate with biofilm was put into the holding device and cotton gauze or debrider were attached to a weight. The weight was pulled over the glass plate at a constant speed of 1.6 cm/s.

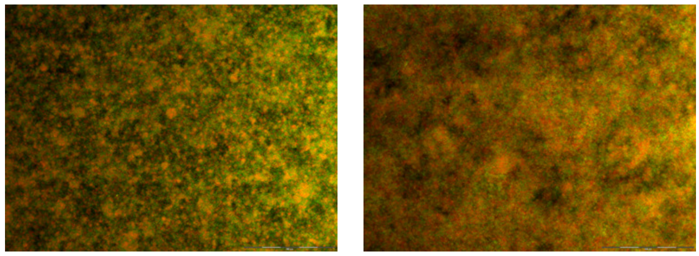

Figure 3: Mature *S. aureus* biofilm on glas plates after 48 hours of incubation stained with SYTO-9/PI.

Results

Monofilament debrider* and cotton gauze** initially exhibited a comparable cleansing performance. However, the monofilament debrider* demonstrated a significantly higher cleansing capacity. While the monofilament debrider' was able to achieve a retained high reduction of the biofilm over wiping several plates, gauze** quickly lost its efficacy (figure 4).

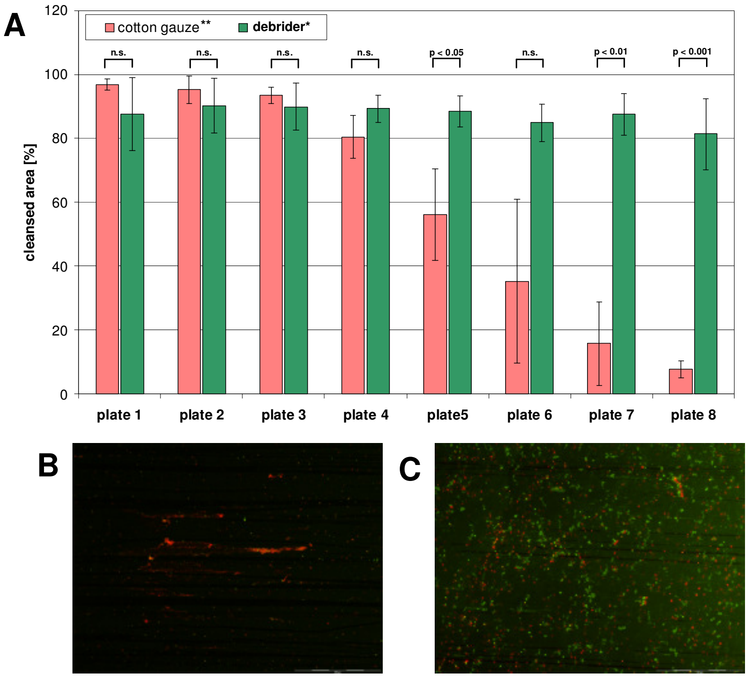

Figure 4: Cotton gauze** or debrider* were used to subsequently cleanse subsequent glass plates each. While cotton gauze quickly lost its efficacy, a significant cleansing effect of the debrider was observed (A). Data presented as mean ± SE from 5 independent experiments. (B) shows a representative example of the glass plates after cleansing with monofilament debrider* and (C) after use of cotton gauze**.

Conclusion

The reduction of biofilm achieved using the monofilament debrider* is significantly higher than that of cotton gauze**. Moreover, it presents a non-invasive and therefore almost painless alternative to other. Hence, this technique should provide a valuable tool in the treatment of patients with chronic wounds to improve the quality of life as well as to safe costs.

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