Determination of the effect of sterilization on the debridement performance of a monofilament debrider device

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Introduction

Wound debridement is a major challenge in the treatment of patients with chronic wounds, especially if wounds are covered with a firm fibrin slough. Here, conventional debridement methods relaying on cotton gauze may not be enough. However, surgical debridement requires trained personal, an operation theatre and, moreover, is often associated with severe pain for the patient. Recently, a debrider device consisting of monofilament fibres* has been introduced presenting a fast and painless option (figure 1). End-point sterilization is required to guarantee material safety, hence, we examined the effect of different sterilization methods on the performance of the debrider device* in vitro and compared it to cotton gauze.

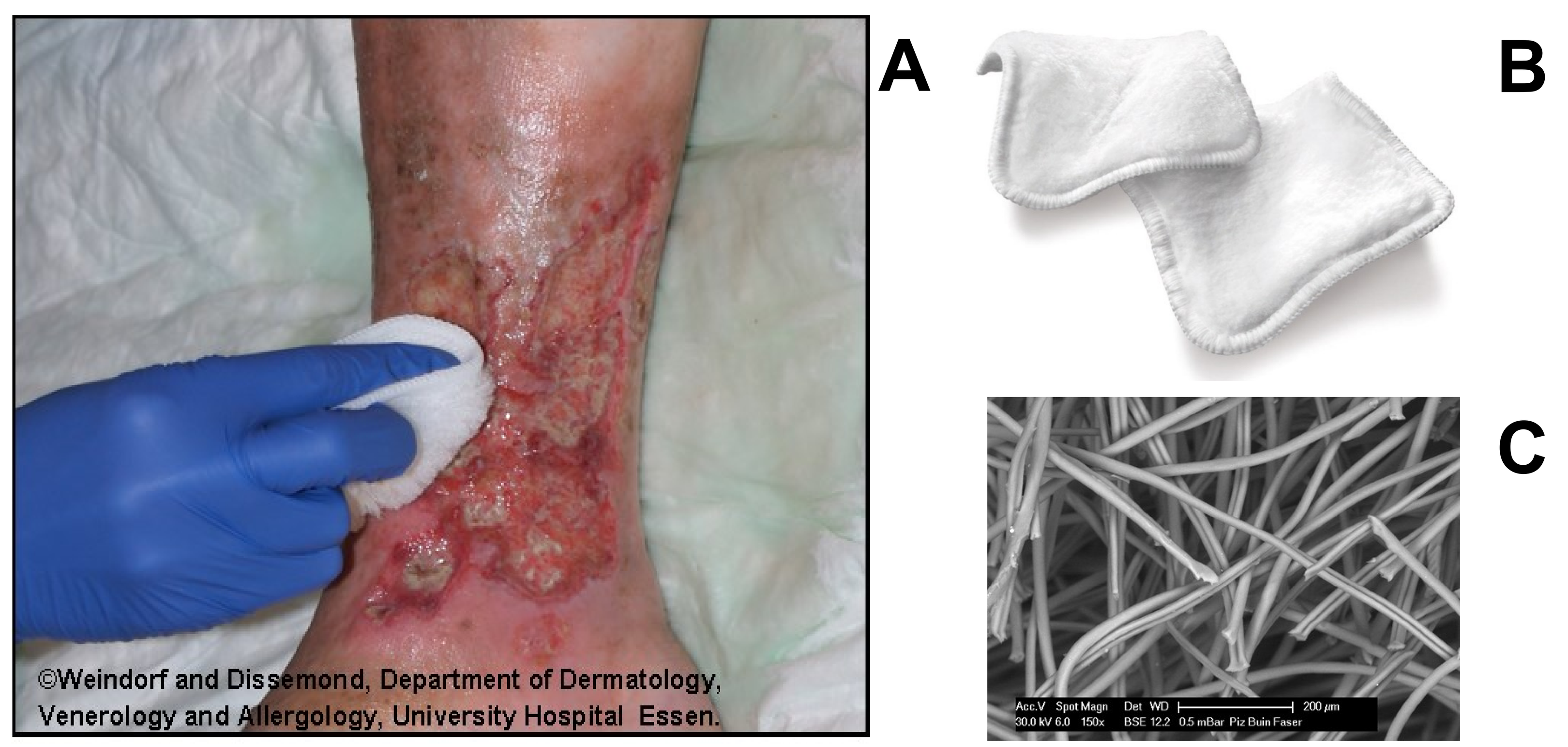

Figure 1: Mechanical debridement (A) with the new debrider (B). The debrider consists of polyester monofilament fibres (C).

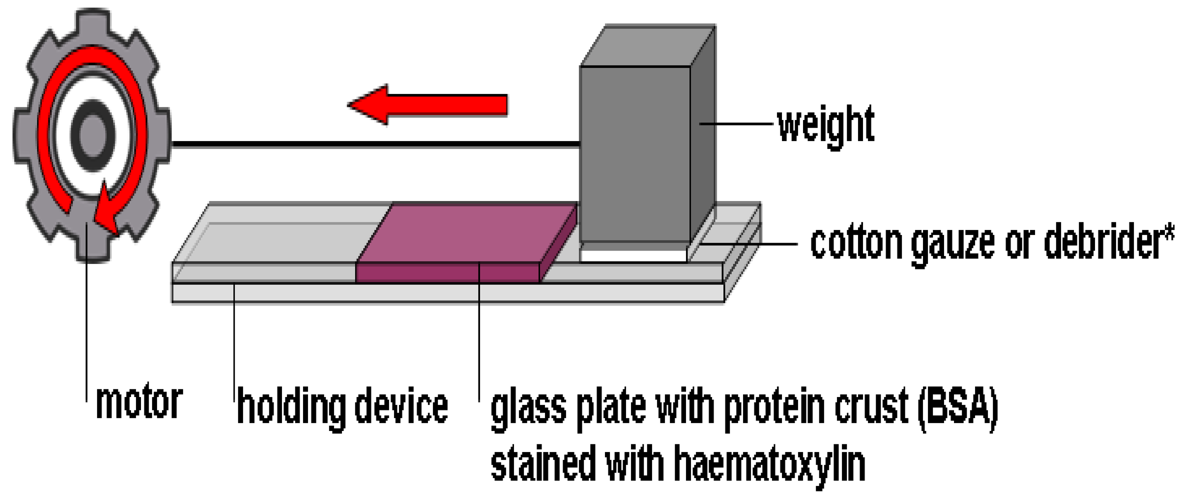

Figure 2: The wound debridment model: Glass plate with BSA cover was put into the holding device and cotton gauze or debrider were attached to a weight. The weight was pulled over the glass plate at a constant speed of 1.6 cm/s.

Material & Methods

The wound debridement model used (figure 2) consists of glass plates coated with 1.5% BSA creating a thick protein crust, to imitate the wound slough, which is stained with haematoxylin. The debrider* and conventional cotton gauze were used to debride/clean the glass plates under standardized conditions (p = 0.067N/cm2, v = 1.6 cm/s). Plate images were obtained before and after treatment. All images were processed using ImageJ 1.45m (NIH, Bethesda, Maryland, U.S.).

Results

It could be shown that the debrider exhibited a significantly higher debridement/cleansing performance than conventional cotton gauze in vitro. The debrider was able to remove more protein slough from the glass surface compared to the cotton gauze used, e.g. cotton gauze reduced the clogged area about 20% while the debrider removed more than 80% of the slough, independently from the end-point sterilization method they were subjected to (figure 3). Moreover, cleansing capacity of the sterilized debrider* samples was examined. It could be shown that debrider* samples retained their cleansing capacity during wiping of ten plates uniformly (figure 4).

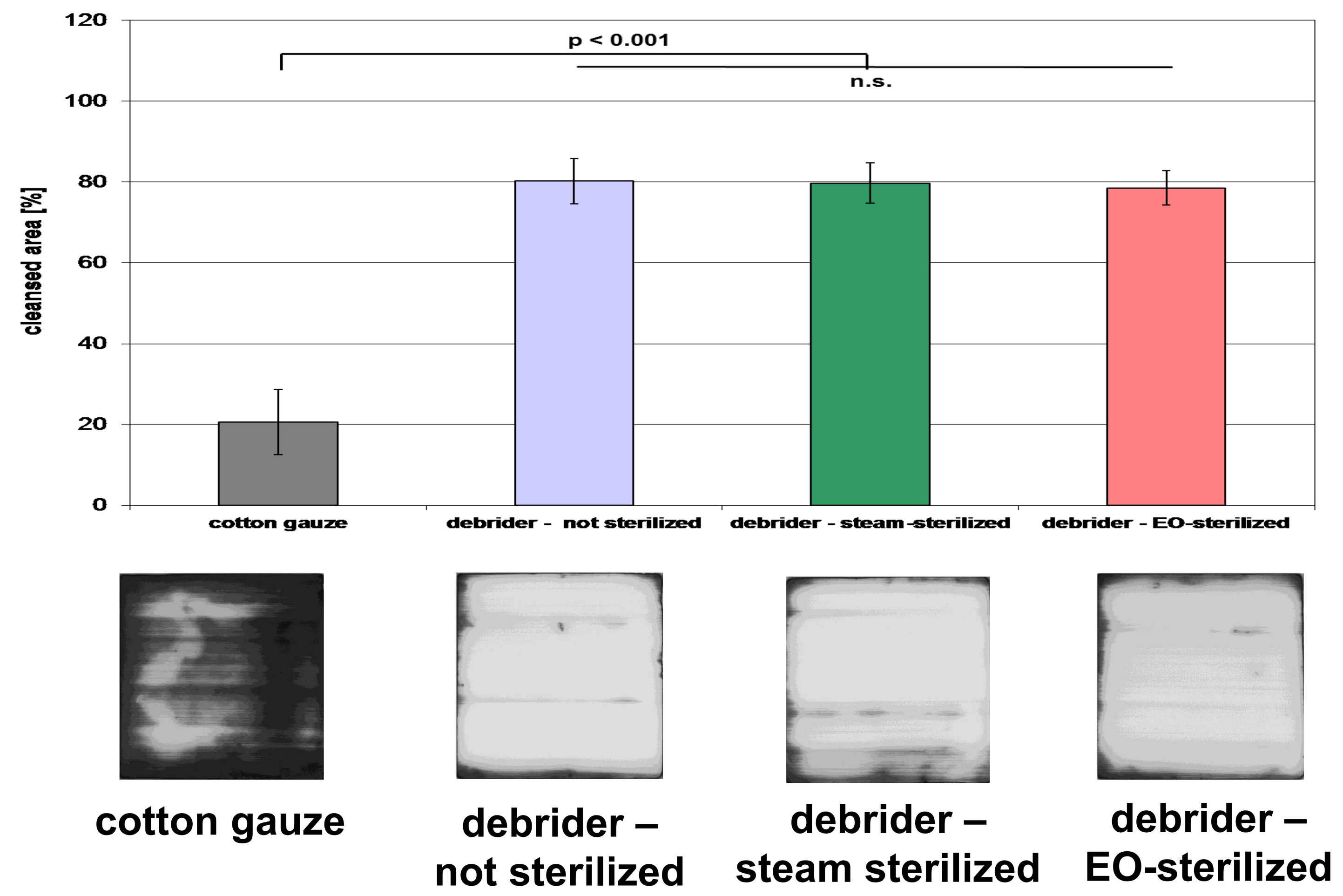

Figure 3: The debrider exhibited a significantly higher cleansing efficacy independent from the sterilization method used compared to cotton gauze. Data presented as mean ± SE from 5 independent experiments. Images show representative examples of glass plates after cleansing.

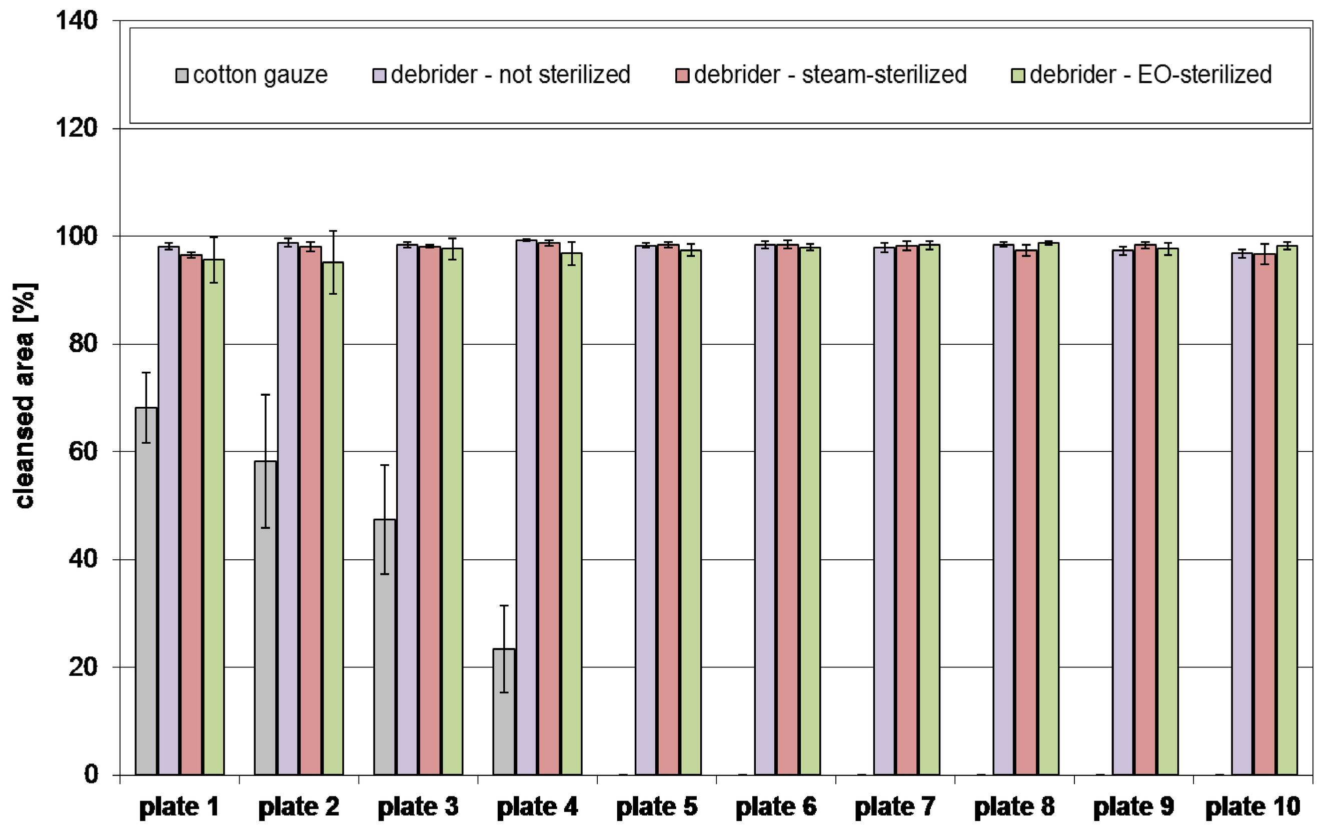

Figure 4: Cotton gauze or differently sterilized debrider were used to subsequently cleanse ten glass plates (0.45% BSA) each. While cotton gauze quickly lost its efficacy, a significant cleansing effect of the debrider was observed independent from prior sterilization procedures. Data presented as mean ± SE from 5 independent experiments.

Conclusion

Debridement performance of the debrider* is significantly higher than that of cotton gauze. Sterilization does not affect the debridement performance. Hence, it presents a non-invasive and therefore almost painless alternative, providing a valuable and safe tool in the treatment of patients with chronic wounds to improve the quality of life.

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