Epicite^{hydro}® as a cooling agent

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Introduction

Cooling a burn injury is essential and can lead to less intradermal damage. Plain tap water at moderate temperature for about 20 to 30 minutes is most efficient. Unfortunately, most burn injuries reach the hospital without any pre-clinical cooling, possibly because of lacking a cooling agent. We investigated if a bacterial nanocellulose (BNC)-based wound dressing containing about 95% water can cool a burn injury sufficiently and if this cooling effect can reduce the intradermal damage.

Methods

A human skin explant model was used after positive ethical vote and written informed consent off the patients. The skin explants were burned with a heated steel block to induce contact burn injuries, of which half were treated with epicite^{hydro}® – a BNC-based-wound dressing – and a paraffin gauze dressing. The other half of the burns were left untreated. Temperature sensors were placed intradermally measuring the temperature changes in the dermis continuously. To measure the depth and verify the intradermal placement a high-resolution ultra sound was used. At different time points, biopsies were taken for histological assessment and the skin surface temperature was measured.

Results

The results show that the application of epicite^{hydro}® significantly reduced the intradermal temperature after the burn injury. The intradermal measurements show maximum temperature spikes of up to 66°C and a rapid decrease after applying the cooling treatment. The area under the curve in the treatment group was 6% less than the untreated with a $p < 0.05$. The application of epicite^{hydro}® reduced the skin surface temperature by 1.5°C. The histological assessment showed concordant results with less dermal damage in the treatment group compared to the untreated group.

Conclusion

The use of a BNC-based wound dressing with a high water content such as epicite^{hydro}® can significantly lower the intradermal temperature after a contact burn and can reduce the thermal damage in the skin. A secondary dressing that allows the water inside the BNC-based wound dressing to evaporate slower additionally prolongs the cooling effect. The use of such a wound dressing could find use in a preclinical setting where water is not ready at hand to cool a burn.