Application of Cold Plasma Technology in the Treatment of Chronic Wounds

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ABSTRACT

Introduction: Plasma, recognized as the fourth state of matter, has gained significant attention in medical science, particularly through the use of cold atmospheric plasma (CAP). This non-thermal plasma modality has emerged as a promising adjunctive therapy for the management of chronic wounds, including diabetic foot ulcers, pressure ulcers, venous leg ulcers, and non-healing burns.

Materials and Methods: A comprehensive review of papers published in the last five years from databases such as Google Scholar, PubMed, and Elsevier was conducted.

Results and Discussion: CAP generates reactive oxygen and nitrogen species capable of exerting potent antimicrobial effects, disrupting bacterial biofilms, and reducing microbial load without inducing thermal damage or promoting antibiotic resistance. Beyond its antimicrobial activity, CAP enhances wound healing by stimulating keratinocyte and fibroblast proliferation, increasing collagen synthesis, promoting angiogenesis, and modulating inflammatory responses. These combined effects contribute to improved tissue regeneration, accelerated wound closure, reduced exudate levels, and mitigation of malodor associated with chronic wound infection. Owing to its non-invasive application, near-ambient temperature, and safety for high-risk patient populations—including those with diabetes, vascular disorders, or advanced age.

Conclusion: Plasma therapy has become an attractive complementary option alongside conventional wound care strategies. Clinical evidence increasingly supports the efficacy of CAP in reducing wound size, improving granulation tissue quality, and shortening overall healing time. Collectively, CAP represents a novel and highly promising tool in modern regenerative medicine and chronic wound management.

Keywords: Chronic wounds, Cold plasma, Wound healing

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