Revolutionizing Burn Management: Integrating Artificial Intelligence with Novel and 3D Dressing Technologies

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ABSTRACT

Introduction: Traditional burn management strategies, although effective, often lack the precision and personalization necessary for optimal healing. The emergence of artificial intelligence (AI) and three-dimensional (3D) printing technologies presents a unique opportunity to revolutionize burn care. AI offers advanced diagnostic capabilities and personalized treatment planning, while 3D printing facilitates the creation of customized tissue constructs and novel wound dressings. This systematic review seeks to evaluate their application and effectiveness within burn therapy, aiming to elucidate their impact on clinical outcomes in burn management.

Search Strategy: Adhering to PRISMA guidelines, this review involved a systematic search of articles published from 2020 to 2023 in four prominent databases: PubMed, Scopus, Web of Science, and Embase. Search terms focused on AI applications in burn management and integrating AI with 3D printing technologies within burn therapy. A total of 43 studies were identified, and 13 articles were included in the systematic review. Any articles not aligning with these criteria or deviating from the central themes of study were excluded to maintain the relevance and accuracy of the review.

Results: AI enhanced diagnostic accuracy, treatment personalization, and monitoring in burn management. Concurrently, 3D printing technologies, particularly bioprinting, showed promising advancements in creating customized skin grafts and dressings, potentially revolutionizing wound healing processes. Studies indicated improved functional outcomes through AI-driven assessments and 3D-printed tissue constructs, with evidence pointing towards reduced healing times and lower infection rates. Integrating these technologies fostered a multidisciplinary approach, suggesting a substantial impact on the future of burn care practices.

Conclusion and Discussion: The convergence of AI and 3D printing signifies a monumental leap forward in burn care. These promising technologies offer a future of personalized and optimized burn therapy, paving the way for enhanced patient outcomes and potentially revolutionizing the entire approach to burn management. AI-driven diagnostics and 3D-printed skin grafts can enhance healing processes and reduce recovery times. As research advances, these innovations are expected to streamline burn care workflows further, decrease complications, and elevate the standard of care for burn patients worldwide.

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