24. POTENTIAL APPLICATIONS OF NANOTECHNOLOGIES AND BIOENGINEERING IN DUPUYTREN'S DISEASE TREATMENT

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Introduction. Dupuytren's disease, characterized by the formation of knots and cords in the palm and finger fascia of the hand, needs significant challenges in treatment due to its progressive nature and tendency for recurrence. In recent years, nanotechnology and bioengineering have emerged as a promising avenue for addressing the complexities of this condition.

Aim of study. The review explores the emerging applications of nanotechnologies and bioengineering in the treatment of Dupuytren's disease, by examining recent advancements.

Methods and materials. A comprehensive search of electronic databases including *Google Scholar, PubMed, Scopus*, and *Web of Science* was conducted to identify relevant studies in the period of time 2020-2024. The search strategy employed a combination of keywords related to nanotechnology, bioengineering, Dupuytren disease, and treatment modalities.

Results. Key areas of focus include targeted drug delivery using engineered nanoparticles, that can be designed to deliver therapeutic agents directly to affected tissues, increasing treatment effectiveness while minimizing side effects. The development of nanostructured scaffolds, that are designed to support tissue regeneration and inhibit contracture progression in affected areas of the hand, present a promising approach for tissue engineering. These scaffolds can mimic the extracellular matrix and provide a supportive environment for cells to grow and regenerate, potentially offering a novel approach to treating Dupuytren disease. Nanoparticle-based imaging involves the use of nanoparticles as contrast agents for advanced imaging techniques such as magnetic resonance imaging, computed tomography, or ultrasound. These nanoparticles are designed to specifically target and accumulate in areas affected by Dupuytren disease, providing enhanced visualization of disease-related structures and processes. By harnessing the unique properties of nanomaterials, researchers aim to enhance the efficacy of current treatments, minimize side effects, and ultimately improve outcomes for patients with Dupuytren's disease.

Conclusion. Despite the early stage of research in this field, the potential of nanotechnology and bioengineering to revolutionize Dupuytren's disease treatment highlights promising advancements. However, further studies are needed to optimize these approaches, evaluate their long-term safety and efficacy, and develop clinically feasible methods for their application in Dupuytren disease.

Keywords. Dupuytren Disease, Nanotechnologies, Bioengineerging.