INFECTIOUS DISEASES (BACTERIAL, FUNGAL, VIRAL, PARASITIC, INFESTATIONS)

EVALUATION OF THE EFFECTS OF PHOTODYNAMIC THERAPY ALONE AND COMBINED WITH CONVENTIONAL ANTIFUNGAL TREATMENT AGAINST BIOFILMS OF T. RUBRUM, T. MENTAGROPHYTES AND M. GYPSEUM

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Onychomycosis with dermatophytoma is the one of the most recalcitrant onychopathic conditions. The existence of fungal biofilms characterized as sessile microbial communities surrounded by highly compacted extracellular polymeric substances is considered to render dermatophytoma remarkably resistant to standard antimicrobial agents. Although antimicrobial photodynamic therapy (aPDT) has been found capable of effectively eliminating multiple systemic biofilm-forming mycoses that affecting internal organs, such approach hasn't been applied to treat the infection of superficial and cutaneous mycoses, which may exhibit distinct susceptibility to light related therapy. In attempt to shed a light on the potential application of aPDT in the clinic treatment of dermatophytic onychomycosis, we investigated aPDT alone or in the combination with various antifungal agents on disrupting biofilm-forming dermatophytes. Here, methylene blue at the concentration of 8, 16, and 32μg/ml applied as photosensitizing agent and light emitting diode (635 ± 10 nm, 60 J/cm2) as light source were employed against six strains of T. rubrum, ten strains of T. mentagrophytes and three strains of M. gypseum isolated from clinical specimens. The sessile minimum inhibitory concentrations (SMICs) were determined using XTT-reduction colorimetric assay to assess antimicrobial susceptibility to terbinafine (TRB), itraconazole (ITC), ciclopirox (CLO) and fluconazole (FLU) when combined with or without aPDT. Our results demonstrated that the treatment of aPDT reduced the growth of all species tested and dermatophytes became substantially more susceptible to antifungal agents after photodynamic therapy. Additionally, the obliteration of biofilm could be observed after aPDT as shattered and ruptured structures being evident in SEM images. Taken together, aPDT is capable of exerting substantial antimicrobial effects against biofilm-forming dermatophytes and effectively increasing their susceptibility to conventional antimicrobial agents, suggesting aPDT could be applied as a novel therapeutic approach for the treatment of recalcitrant onychopathic dermatophytoma in clinical practice.