INTISARI

Pendahuluan: Keloid merupakan kelainan fibrosis kulit yang disebabkan kegagalan fibroblas dalam menghambat MMP-1 dan TGF-β1 berakibat pada migrasi dan proliferasi fibroblas secara berlebih. Terdapat berbagai macam terapi keloid namun belum terdapat satupun yang dikatakan efektif sehingga diperlukan pengembangan pengobatan, salah satunya adalah fototerapi sinar biru. Sinar biru menginduksi generasi ROS, menurunkan MMP-1, dan TGF-β1 menyebabkan penghambatan viabilitas sel dan apoptosis. Penambahan fotosensitiser dapat meningkatkan efek sinar biru. Salah satu fotosensitiser sinar biru adalah kurkumin dengan serapan 300-500 nm yang tumpang tindih dengan emisi sinar biru 400-500nm.
Tujuan: Penelitian ini bertujuan untuk menunjukkan bahwa kombinasi kurkumin dan sinar biru lebih menurunkan viabilitas fibroblas dibandingan dengan sinar biru saja.
Metode: Penelitian ini merupakan penelitian eksperimental *in vitro* dengan sampel kultur fibroblas keloid manusia. Terdapat 4 kelompok perlakuan yaitu fibroblas tanpa perlakuan (kontrol), fibroblas yang disinari sinar biru dosis 30J/cm^2, fibroblas yang diberi kurkumin (dosis 1.25µg/ml, 2.5µg/ml, 5µg/ml, 10µg/ml, 20µg/ml), dan fibroblas yang diberi kurkumin dan dipapar sinar biru. Setiap kelompok perlakuan dinilai viabilitas dengan MTT. Penilaian IC50 kurkumin dinilai dengan regresi linier.
Hasil: Pemberian sinar biru 30J/cm2 secara signifikan menurunkan viabilitas fibroblas keloid. Tingkat viabilitas fibroblas keloid yang diberi dosis kurkumin 20µg/ml sebesar 72.01% (± SD 13.31) secara signifikan menurunkan viabilitas fibroblas keloid dibandingkan kelompok kontrol. Tingkat viabilitas fibroblas keloid yang dipapar sinar biru dengan dosis kurkumin 5µg/ml sebesar 36.51% (± SD 9.25), dosis 10µg/ml sebesar 15.94% (± SD 2.74), dosis 20 µg/ml sebesar 15.85% (± SD 3.85) secara signifikan menurunkan viabilitas fibroblas keloid dibanding kelompok kontrol maupun sinar biru saja. Kurkumin dengan sinar biru secara signifikan menurunkan tingkat viabilitas fibroblas keloid dibandingkan dengan kurkumin saja. IC50 kurkumin untuk menurunkan viabilitas fibroblas keloid sebesar 72.86 µg/ml, menurun hingga 2.77 µg/ml bila dipapar dengan sinar biru.
Kesimpulan: Sinar biru dan kurkumin dosis tinggi (20 µg/ml) berpengaruh menurunkan tingkat viabilitas fibroblas keloid. Namun, kombinasi sinar biru dan kurkumin lebih menurunkan tingkat viabilitas fibroblas keloid dibandingkan dengan sinar biru atau kurkumin saja. Dosis IC50 kurkumin untuk menurunkan viabilitas fibroblas keloid sebesar 72.86 µg/ml, menurun hingga 2.77 µg/ml bila dipapar dengan sinar biru.

Kata Kunci: Fibroblas Keloid; Sinar Biru; Sinar Tampak; Kurkumin; Fotosensitiser

ABSTRACT

Background: *Keloid is a skin fibrotic disorder characterized by excessive collagen deposition and abnormal wound healing, primarily caused by dysregulated fibroblast activity failing to inhibit matrix metalloproteinase-1 (MMP-1) and transforming growth factor-beta 1 (TGF-β1). This dysregulation results in excessive fibroblast migration and proliferation. While various therapeutic approaches exist, none have demonstrated consistent efficacy, necessitating the development of novel treatment strategies. Blue light phototherapy has emerged as a promising intervention. It generates reactive oxygen species (ROS), downregulates MMP-1 and TGF-β1 expression, and consequently inhibits cell viability while promoting apoptosis. The therapeutic efficacy of blue light can be enhanced by photosensitizers, such as curcumin, which exhibits an absorption spectrum of 300-500 nm that effectively overlaps with blue light emission (400-500 nm).*

Objective: *To evaluate the synergistic effect of curcumin combined with blue light on keloid fibroblast viability compared to blue light monotherapy.*

Methods*: This in vitro experimental study utilized cultured human keloid fibroblasts. Four experimental groups were established: (1) untreated fibroblasts (control group), (2) fibroblasts irradiated with blue light at 30 J/cm², (3) fibroblasts treated with varying concentrations of curcumin (1.25, 2.5, 5, 10, and 20 µg/mL), and (4) fibroblasts treated with both curcumin and blue light irradiation. Cell viability was assessed using the MTT assay. The half-maximal inhibitory concentration (IC50) of curcumin was determined through linear regression analysis.*

Result: *Blue light irradiation at 30 J/cm² significantly reduced keloid fibroblast viability. Treatment with curcumin at 20 µg/mL resulted in a fibroblast viability of 72.01% ± 13.31% (mean ± SD), representing a significant reduction compared to the control group. Combined treatment with blue light and curcumin demonstrated dose-dependent effects: at 5 µg/mL curcumin, viability decreased to 36.51% ± 9.25%; at 10 µg/mL, to 15.94% ± 2.74%; and at 20 µg/mL, to 15.85% ± 3.85%. These reductions were significantly greater than those observed with either control or blue light monotherapy. The combination therapy showed superior efficacy compared to curcumin alone. The IC50 of curcumin decreased substantially from 72.86 µg/mL in monotherapy to 2.77 µg/mL when combined with blue light exposure.*

Conclusion: *Both blue light irradiation and high-dose curcumin (20 µg/mL) effectively reduced keloid fibroblast viability. The combination of blue light and curcumin demonstrated synergistic effects, achieving greater reductions in fibroblast viability compared to either treatment alone. Notably, blue light exposure markedly enhanced curcumin's potency, reducing its IC50 from 72.86 µg/mL to 2.77 µg/mL.*

Keywords*: Keloid Fibroblast; Blue Light; Visible Light; Curcumin; Photosensiter*