What is optimal dose, power density and timing for low level laser therapy in tendon injuries? A review of in vitro and in vivo trials

Laser doux

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Purpose: To investigate the effect of different laser treatment parameters on fibroblast inflammation and production of collagen fibers.
Material : Controlled in vitro or in vivo trials with low level laser therapy (LLLT) Method : Literature search for trials published after 1980 using LLLT on Medline, Embase, Cochrane Library and handsearch of physiotherapy journals in English and Scandinavian languages. Optimal treatment parameters regarding timing, treatment frequency, dose and power density at target tissue were synthesized.

Results : The literature search identified 31 controlled trials with LLLT on collagen tissue. Three in vitro trials were performed on stretch-induced and inflammation in fibroblast cultures and five in vitro trials were performed on collagen production. Optimal dose and power density for inhibition of prostaglandin PGE2 and interleukin 1- beta production was found to be 3.2-6.3 J/cm2 and 5.3 mW/cm2 measured at the target fibroblast cells after 5 days of irradiation. Data on upper range limits for anti-inflammatory treatment were inconclusive. Optimal dose and power density for collagen production was found to be in the range 0.2-2.0 J/cm2 and 2 .20 mW/cm2 measured at the target fibroblast cells. Daily treatment for 2 weeks with optimal parameters yielded a maximum increase in collagen production of 37%. The results from three in vivo trials showed similar increase in collagen production. Doses in excess of 4.5 J/cm2 and power densities higher than 30 mW/cm2 inhibited fibroblast metabolism and decreased collagen production.

Conclusion : There is evidence of a dose-response pattern for LLLT in the treatment of tendon injuries during the proliferative phase of regeneration.