Irradiation by pulsed Nd:YAG laser induces the production of extracellular matrix molecules by cells of the connective tissues. A tool for tissue repair.

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ABSTRACT

Many studies demonstrated that mechanical stress is a key factor for tissue homeostasis, while unloading induce loss of mass and impairment of function. Because of their physiological function, muscle, connective tissue, bone and cartilage dynamically interact with mechanical and gravitational stress, modifying their properties through the continuous modification of their composition. Indeed, it is known that mechanical stress increases the production of extracellular matrix (ECM) components by cells, but the mechanotransduction mechanisms and the optimal loading conditions required for an optimal tissue homeostasis are still unknown. Considering the importance of cell activation and ECM production in tissue regeneration, a proper use of mechanical stimulation could be a powerful tool in tissue repair and tissue engineering.
Studies exploring advanced modalities for supplying mechanical stimuli are needed to increase our knowledge on mechanobiology and to develop effective clinical applications.
Here we describe the effect of photomechanical stress, supplied by a pulsed Nd:YAG laser on ECM production by cells of connective tissues.
Cell morphology, production of ECM molecules (collagens, fibronectin, mucopolysaccharides), cell adhesion and cell energy metabolism have been studied by using immunofluorescence and autofluorescence microscopy. The results show that photomechanical stress induces cytoskeleton remodelling, redistribution of membrane integrins, increase in production of ECM molecules. These results could be of consequence for developing clinical protocols for the treatment of connective tissue dideases by pulsed Nd:YAG laser.

Keywords: Pulsed Nd:YAG laser, extracellular matrix, photomechanical effect, connective tissue, fibroblasts, mesenchymal cells, chondrocytes, mechanotransduction

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