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**Presenting a Method to Improve Bone Quality Through Stimulation of Osteoporotic Mesenchymal Stem Cells by Low-Level Laser Therapy.**

[Bayat M](https://www.ncbi.nlm.nih.gov/pubmed/?term=Bayat%20M%5BAuthor%5D&cauthor=true&cauthor_uid=28621568)1, [Jalalifirouzkouhi A](https://www.ncbi.nlm.nih.gov/pubmed/?term=Jalalifirouzkouhi%20A%5BAuthor%5D&cauthor=true&cauthor_uid=28621568)2.

[**Author information**](https://www.ncbi.nlm.nih.gov/pubmed/28621568)

**Abstract**

**OBJECTIVE:**

This review aims to present a method to improve bone quality through stimulation of osteoporotic mesenchymal stem cells (MSCs) by low-level laser therapy (LLLT).

**BACKGROUND:**

Osteoporosis (OP) is characterized by decreased bone mass and bone strength, which results in an increased incidence of bone fractures. These fractures often lead to additional disability and mortality. Osteoporotic MSCs have reduced osteogenic differentiation when cultured in their standard differentiation media. LLLT has a biostimulatory effect on fibroblasts and osteoblasts. MSCs have the ability to generate cells of connective tissue lineages, which includes the bones. Recently, transplantation of in vitro cultured bone marrow (BM) MSCs into sites at risk for development of osteoporotic bone has resulted in improved bone structure.

**METHODS:**

Comprehensive research was performed using PubMed, and biostimulatory effect of LLLT on bony cells and MSCs were studied.

**RESULTS:**

LLLT can stimulate growth, proliferation, and differentiation of SCs in vitro and in vivo. This ability of LLLT is an essential prerequisite for performing experiments related to disease control in humans. Thus, laser-treated osteoporotic autologous BMMSCs may represent a promising therapeutic method to protect the bones in patients with OP and prevent fractures in these patients. Therefore, researchers hypothesize that transplantation of in vitro laser-treated autologous cultured osteoporotic BMMSCs that have the appropriate osteogenic phenotype into sites at risk for development of osteoporotic bone may result in improved bone structure. In this respect, investigators have successfully used LLLT to restore autologous osteoporotic MSCs in vitro. Subsequently, these cells have been differentiated into osteoblast cell lines with the use of laser treatment after which they were transplanted into osteoporotic animal models.

**CONCLUSIONS:**

This technique might improve bone quality and structure. However, additional research must be undertaken to understand the underlying mechanisms of this treatment, validate its effectiveness, and assess the feasibility for clinical application of LLLT to treat MSCs in regeneration of osteoporotic bone.

**KEYWORDS:**

fracture; low-level laser therapy; mesenchymal stem cells; osteoporosis; regenerative medicine

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