



Mechanical stress induced S100A7 expression in human dental pulp cells to augment osteoclast differentiation

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Abstract

Objectives: Mechanical injury of dental pulp leads to root resorption by osteoclasts/odontoclasts. S100 proteins have been demonstrated to be involved in inflammatory processes and bone remodeling. This study aimed to investigate the effect of mechanical stress on S100A7 expression by human dental pulp cells (HDPCs) and the effect of S100A7 proteins on osteoclast differentiation.

Materials and Methods: Isolated HDPCs were stimulated with compressive loading (2 and 6 hr), or shear loading (2, 6, and 16 hr). S100 mRNA expression and S100A7 protein levels were determined by real-time PCR and ELISA, respectively. Osteoclast differentiation was analyzed using primary human monocytes. The differentiation and activity of osteoclasts were examined by TRAcP staining and dentine resorption. In addition, the expression of S100A7 was analyzed in pulp tissues obtained from orthodontically treated teeth.

Results: Compressive and shear mechanical stress significantly upregulated both mRNA and protein level of S100A7. Dental pulp tissues from orthodontically treated teeth exhibited higher S100A7 mRNA levels compared to non-treated control teeth. S100A7 promoted osteoclast differentiation by primary human monocytes. Moreover, S100A7 significantly enhanced dentine resorption by these cells.

Conclusions: Mechanical stress induced expression of S100A7 by human dental pulp cells and this may promote root resorption by inducing osteoclast differentiation and activity.

KEYWORDS

dental pulp, inflammation, mechanical stress, Osteoclast, S100 protein, S100A7