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Modulation der Genexpression von Integrin αvβ3, α5β1 und anderen Liganden der extrazellulären Matrix in parodontalen Ligamentzellen unter dem Einfluss mechanischer Dehnung

Promotionsfach: Mund-Zahn-Kieferheilkunde

Doktorvater: Prof. Dr. Pascal Tomakidi

This study investigated the effects of mechanical strain on human PDL-fs and osteoblasts with the goal of identifying important extracellular matrix mediators in relation to mechanical forces which also act on the periodontium during clinically-induced orthodontic tooth movement. We examined gene and protein expression using the techniques of RT-PCR and western blot analysis, as well as gene array analysis. Surprisingly, many of the extracellular matrix molecules showed no or minor modulation in PCR studies, including integrins αvβ3 and α5β1. MMP-1, MMP-13 and IGF-1 did show significant modulation in response to mechanical strain. Protein expression of MMP-13 in PDL-fs was also up-regulated in response to cell strain, but not MMP-1 and (MMP-13 inhibitor) TIMP-1. Western blot analysis was further used for the study of the mechanistic pathways MMP-13 uses following cell strain, where kinases p38 and $p42/44^{ERK}$ both demonstrated an up-regulation of the phosphylated or activated protein form. Inhibitors to these kinases identified that MMP-13 relies on both kinases in its signal-/mechan-transduction response to cell strain in PDL-fs. Thus, MMP-13 may be a candidate molecule to be involved in the turn over processes, addressing the extracellular matrix (ECM) in response to mechanical stretch/strain forces. Translation of this knowledge into clinic suggests matrix

metalloproteinases, such as MMP-13 also to be involved in the ECM turn over induced by therapeutically applied mechanical forces during orthodontic tooth movement.