

Effect of orthodontic forces on levels of enzymes in gingival crevicular fluid (GCF): A systematic review



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Objective: Orthodontic force application releases multiple enzymes in gingival crevicular fluid (GCF) for activation, resorption, reversal, deposition of osseous elements and extracellular matrix degradation. The current systematic review critically evaluated all existing evidence on enzymes in orthodontic tooth movement.

Methods: Literature was searched with predetermined search strategy on electronic databases (PubMed, Scopus, Embase), along with hand search.

Results: Initial search identified 652 studies, shortlisted to 52 studies based on PRISMA. Quality assessment further led to final inclusion of 48 studies (13 moderately and 35 highly sensitive studies). Primary outcomes are significant upregulation in GCF levels of enzymes—*aspartate aminotransferase (AST)*, *alkaline phosphatase (ALP)*, *matrix metalloproteinases (MMPs)*, *lactate dehydrogenase (LDH)*, *β-glucuronidase (βG)*, *tartrate resistant acid phosphatase (TRAP)*, *acid phosphatase (ACP)* and down regulation in *cathepsin B (Cb)*. Site specificity is shown by ALP, TRAP, AST, LDH, MMP9 with levels at compression site increasing earlier and in higher quantities compared with tension site. ALP levels are higher at tension site only in retention. A positive correlation of LDH, ALP and AST is also observed with increasing orthodontic force magnitude.

Conclusions: A strong evidence of variation in enzymes (ALP, AST, ACP TRAP, LDH, MMPs, Cb) in GCF is found in association with different magnitude, stages and sites of orthodontic force application.

Keywords: Tooth movement. Gingival crevicular fluid (GCF). Enzymes. Systematic review.

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