

Meta-Analysis of Local Tetracycline Delivery Devices as Adjuncts to Non-Surgical Periodontal Therapy

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Scaling and root planning (SRP) is a form of sub-gingival mechanical debridement (often now called “subgingival instrumentation”), and remains the standard non-surgical treatment for periodontitis. Adjunctive tetracycline-based drug delivery may enhance outcomes by controlling subgingival pathogens. This meta-analysis evaluated the short-term (1–3 months) and long-term (6–24 months) efficacy of sustained and controlled-release tetracycline as adjuncts to SRP in chronic periodontitis. A systematic search of PubMed, Cochrane Central, Scopus, and Embase identified randomized controlled trials published until July 2021. Test groups received SRP plus locally delivered tetracyclines, while controls underwent SRP alone or with a placebo. Meta-analysis (R software) calculated weighted mean differences (WMDs) and 95% confidence intervals (CIs) for probing pocket depth (PPD) and clinical attachment level (CAL). Meta-regression analyzed study design, assessment approach, and smoking status. Heterogeneity was assessed via Cochrane’s Q and I², with publication bias checked using funnel plots and Egger’s test. Fifty-seven studies were included in the analysis. According to the results, adjunctive tetracycline therapy yielded statistically significant improvements over SRP alone. Short-term PPD reductions were significant (WMD = 0.501, 95% CI [0.411; 0.591]), with continued benefits at 6–9 months (WMD = 0.516, 95% CI [0.413; 0.620]) and beyond 12 months (WMD = 0.371, 95% CI [0.181; 0.560]). Similar trends were seen for CAL gains at 1–3 months (WMD = 0.310, 95% CI [0.224; 0.396]), 6–9 months (WMD = 0.336, 95% CI [0.204; 0.467]), and beyond 12 months (WMD = 0.310, 95% CI [0.240; 0.381]). Out of the Tetracycline formulations, Actisite showed the greatest short-term PPD reduction (WMD = 0.705, 95% CI [0.503; 0.907]). Meta-regression indicated study design significantly influenced outcomes, with split-mouth designs showing greater short-term ($\beta = 0.372$, 95% CI [0.219; 0.525], $p < 0.05$) and 6–9-month ($\beta = 0.422$, 95% CI [0.231; 0.613], $p < 0.05$) improvements. Conclusively, localized tetracycline adjuncts to SRP effectively improve periodontal outcomes in both the short and long terms, with effectiveness varying by study design and patient subgroups.

Keywords: Chronic periodontitis, clinical attachment level, doxycycline, meta-analysis, minocycline, probing pocket depth, tetracycline

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