RESEARCH PAPER

Assessment of the capability of Local Drug Delivery to improve Periodontal health: A Clinical Study

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ABSTRACT

Background: Local drug delivery (LDD) systems have been introduced as adjuncts or alternatives to scaling and root planing (SRP) in the management of periodontal diseases. However, the clinical relevance of their benefits remains uncertain.

Aim: To evaluate the effectiveness and clinical significance of LDD systems in periodontal therapy.

Methods: A critical appraisal of controlled clinical trials and systematic reviews assessing LDD in comparison with SRP alone or in combination was conducted.

Results: LDD used as monotherapy demonstrated outcomes comparable to SRP. When used adjunctively, statistically significant improvements in probing depth reduction were observed, although the magnitude of change was minimal (often <0.5 mm). Evidence regarding benefits in deep pockets, disease progression, and bone regeneration remains inconsistent.

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Conclusion: While LDD may provide additional benefits in selected cases, its routine use is not justified. Clinical decision-making should be based on individual patient needs, disease severity, and treatment objectives rather than statistical outcomes alone..

Keywords: Periodontitis, Local drug delivery, Scaling and root planing, Clinical significance, Antimicrobial therapy.

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INTRODUCTION

Periodontitis is a chronic inflammatory disease resulting from a complex interaction between pathogenic microorganisms and host immune responses, leading to destruction of periodontal tissues. Conventional non-surgical therapy, particularly scaling and root planing (SRP), remains the cornerstone of treatment and is effective in reducing microbial load and inflammation.[1,2,3]

Adjunctive antimicrobial therapies have been developed to enhance treatment outcomes, especially in sites that are unresponsive to mechanical debridement. Local drug delivery (LDD) systems offer the advantage of delivering high concentrations of antimicrobial

agents directly into periodontal pockets with minimal systemic exposure.[4,5,6]

Despite promising results, there is ongoing debate regarding whether statistically significant improvements reported in clinical trials translate into clinically meaningful benefits.[7]

Materials and Methods

A narrative review approach was adopted based on previously published controlled clinical trials and systematic analyses evaluating local drug delivery systems in periodontal therapy. Studies comparing LDD as monotherapy or adjunctive therapy with SRP were included. Emphasis was placed on clinical outcomes such as probing depth reduction, clinical attachment gain, and disease progression.

Results

1. Local Drug Delivery as Monotherapy

Several studies have demonstrated that LDD systems such as doxycycline gel, tetracycline fibers, and metronidazole gel produce clinical outcomes comparable to SRP alone.[8,9,10,11] Mean probing depth reduction achieved with LDD monotherapy is approximately 1 mm, indicating no significant superiority over mechanical therapy.

2. Adjunctive Use of Local Drug Delivery

When combined with SRP, LDD systems have shown statistically significant improvements in periodontal parameters. However, the magnitude of these improvements is generally small.

Table 1: Clinical Outcomes of Different Treatment Modalities

Treatment Modality	Probing Depth Reduction	Clinical Attachment Gain
SRP alone	Moderate	Moderate
LDD alone	Comparable to SRP	Comparable
SRP + LDD	Slightly greater	Minimal improvement

Meta-analysis data indicate an average additional probing depth reduction of approximately 0.3 mm with adjunctive therapy, while gains in clinical attachment are often not statistically significant.[12]

3. Clinically Significant Outcomes

Probing Depth Reduction ≥2 mm

A reduction of ≥2 mm is considered clinically meaningful. Studies show a higher percentage of such improvements with adjunctive LDD, although high Number Needed to Treat (NNT) values suggest limited practical benefit.[13]

Deep Periodontal Pockets (≥7 mm)

Evidence regarding the effectiveness of LDD in deep pockets is inconsistent. Some studies report improved outcomes, whereas others show no additional benefit compared to SRP alone.[14,15,16]

Conversion to Shallow Pockets (<5 mm)

Adjunctive therapy may slightly increase the likelihood of achieving shallow pockets, though the overall impact remains modest.[13]

4. Effect on Disease Progression

Limited evidence suggests that LDD may reduce disease progression in certain cases. However, findings are inconsistent due to variations in study design and follow-up periods.[17]

5. Bone Regeneration

The effect of LDD on bone regeneration is minimal when compared to surgical interventions.

Table 2: Comparison of Bone Gain

Treatment	**Mean Bone Gain**
LDD + SRP	0.1–0.5 mm
Open flap debridement	~1.1 mm
Bone grafts	~2.1 mm
Guided tissue regeneration	~3.1 mm

Discussion

The primary challenge in evaluating LDD systems lies in distinguishing statistical significance from clinical relevance. Small improvements in probing depth may not necessarily alter treatment outcomes or clinical decisions.[7]

The concept of Number Needed to Treat (NNT) provides additional insight into the practical value of therapy, indicating that multiple sites

often need to be treated to achieve a meaningful benefit at a single site.[13]

Local drug delivery offers advantages such as targeted action and minimal systemic effects. However, its limitations include cost, need for repeated applications, and modest clinical benefits.[18]

Systemic antibiotics, although associated with potential adverse effects, may be more effective in cases involving widespread infection or tissue-invasive pathogens.[19]

Conclusion

Local drug delivery systems provide modest adjunctive benefits in periodontal therapy, particularly when used alongside SRP. However, these benefits are often limited in magnitude and may not always be clinically significant. Therefore, the use of LDD should be individualized based on patient characteristics, disease severity, and treatment goals rather than relying solely on statistically significant outcomes.

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