

COMPARATIVE EFFICACY OF INTERDENTAL BRUSHES, DENTAL FLOSS, AND DENTAL TAPE IN PLAQUE CONTROL AND PERIODONTAL HEALTH: A SYSTEMATIC REVIEW OF CLINICAL EVIDENCE

EFICÁCIA COMPARATIVA DE ESCOVAS INTERDENTAIS, FIO DENTAL E FITA DENTAL NO CONTROLE DE PLACA E SAÚDE PERIODONTAL: UMA REVISÃO SISTEMÁTICA DE EVIDÊNCIAS CLÍNICAS

EFICACIA COMPARATIVA DE LOS CEPILLOS INTERDENTALES, EL HILO DENTAL Y LA CINTA DENTAL EN EL CONTROL DE LA PLACA Y LA SALUD PERIODONTAL: UNA REVISIÓN SISTEMÁTICA DE LA EVIDENCIA CLÍNICA

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ABSTRACT

Background: Effective interdental biofilm control is critical for preventing gingivitis and periodontitis. While dental floss has long been considered the gold standard for interdental cleaning, its efficacy depends heavily on patient compliance and dexterity. Dental tape, a broader variant of floss, may improve comfort in tight contacts, while interdental brushes have

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gained prominence for their superior mechanical plaque removal. Comparative evidence on these devices remains heterogeneous.

Methods: A systematic search of PubMed, EMBASE, Cochrane Library, and Scopus was performed up to August 2025 using MeSH and free-text terms ("interdental brush," "proximal brush," "dental floss," "dental tape," "interdental cleaning," "biofilm control," "periodontal health"). Eligible studies included randomized controlled trials (RCTs), controlled clinical trials, systematic reviews, and meta-analyses comparing interdental brushes, floss, or dental tape as adjuncts to toothbrushing.

Results: The search strategy identified RCTs evaluating interdental cleaning devices, while additional scoping reviews and systematic analyses included systematic reviews and several controlled trials. Across these studies, interdental brushes consistently demonstrated greater reductions in plaque and gingival inflammation compared with floss, particularly in patients with periodontal attachment loss, prosthetic restorations, or orthodontic appliances. Dental floss and dental tape showed comparable efficacy when used correctly, though tape was reported as more comfortable in tight interproximal contacts. Patient adherence and technique emerged as critical determinants of effectiveness, irrespective of the device used.

Conclusion: Interdental brushes outperform floss and tape in plaque removal and gingival inflammation reduction, especially in patients with larger interdental spaces. Floss and tape remain useful for tight contacts but are highly technique-dependent. Individualized recommendations should guide clinical practice, considering anatomical factors, manual dexterity, and patient preference. High-quality, long-term RCTs directly comparing floss, tape, and interdental brushes are still required to strengthen clinical guidelines.

Keywords: Interdental Cleaning. Interdental Brush. Dental Floss. Dental Tape. Plaque Control. Periodontal Health.

RESUMO

Contexto: O controle eficaz do biofilme interdental é fundamental para a prevenção de gengivite e periodontite. Embora o fio dental seja considerado há muito tempo o padrão ouro para a limpeza interdental, sua eficácia depende fortemente da adesão e da destreza do paciente. A fita dental, uma variante mais ampla do fio dental, pode melhorar o conforto em contatos apertados, enquanto as escovas interdentais ganharam destaque por sua remoção mecânica superior da placa bacteriana. As evidências comparativas sobre esses dispositivos permanecem heterogêneas.

Métodos: Uma busca sistemática nas bases de dados PubMed, EMBASE, Cochrane Library e Scopus foi realizada até agosto de 2025, utilizando termos MeSH e de texto livre ("escova interdental", "escova proximal", "fio dental", "fita dental", "limpeza interdental", "controle do biofilme", "saúde periodontal"). Os estudos elegíveis incluíram ensaios clínicos randomizados (ECRs), ensaios clínicos controlados, revisões sistemáticas e metanálises comparando escovas interdentais, fio dental ou fita dental como adjuvantes à escovação dentária.

Resultados: A estratégia de busca identificou ECRs avaliando dispositivos de limpeza interdental, enquanto revisões de escopo e análises sistemáticas adicionais incluíram revisões sistemáticas e diversos ensaios controlados. Nesses estudos, as escovas

interdentais demonstraram consistentemente maiores reduções na placa bacteriana e na inflamação gengival em comparação com o fio dental, particularmente em pacientes com perda de inserção periodontal, restaurações protéticas ou aparelhos ortodônticos. O fio dental e a fita dental apresentaram eficácia comparável quando usados corretamente, embora a fita tenha sido relatada como mais confortável em contatos interproximais apertados. A adesão do paciente e a técnica utilizada emergiram como determinantes críticos da eficácia, independentemente do dispositivo utilizado.

Conclusão: As escovas interdentais superam o fio dental e a fita na remoção da placa bacteriana e na redução da inflamação gengival, especialmente em pacientes com espaços interdentais maiores. O fio dental e a fita continuam sendo úteis para contatos apertados, mas são altamente dependentes da técnica. Recomendações individualizadas devem orientar a prática clínica, considerando fatores anatômicos, destreza manual e preferência do paciente. Ainda são necessários ECRs de longo prazo e alta qualidade comparando diretamente fio dental, fita e escovas interdentais para fortalecer as diretrizes clínicas.

Palavras-chave: Limpeza Interdental. Escova Interdental. Fio Dental. Fita Dental. Controle de Placa. Saúde Periodontal.

RESUMEN

Antecedentes: El control eficaz de la biopelícula interdental es fundamental para prevenir la gingivitis y la periodontitis. Si bien el hilo dental se ha considerado durante mucho tiempo el método de referencia para la limpieza interdental, su eficacia depende en gran medida del cumplimiento y la destreza del paciente. La cinta dental, una variante más amplia del hilo dental, puede mejorar la comodidad en los contactos estrechos, mientras que los cepillos interdentales han cobrado relevancia por su superior capacidad para eliminar la placa mecánicamente. La evidencia comparativa sobre estos dispositivos sigue siendo heterogénea.

Métodos: Se realizó una búsqueda sistemática en PubMed, EMBASE, Cochrane Library y Scopus hasta agosto de 2025 utilizando términos MeSH y de texto libre ("interdental brush", "proximal brush", "dental floss", "dental tape", "interdental cleaning", "biofilm control", "periodontal health"). Los estudios elegibles incluyeron ensayos controlados aleatorizados (ECA), ensayos clínicos controlados, revisiones sistemáticas y metaanálisis que comparaban cepillos interdentales, hilo dental o cinta dental como complementos del cepillado dental.

Resultados: La estrategia de búsqueda identificó ECA que evaluaban dispositivos de limpieza interdental, mientras que revisiones exploratorias adicionales y análisis sistemáticos incluyeron revisiones sistemáticas y varios ensayos controlados. En estos estudios, los cepillos interdentales demostraron consistentemente una mayor reducción de la placa y la inflamación gingival en comparación con el hilo dental, especialmente en pacientes con pérdida de inserción periodontal, restauraciones protésicas o aparatos de ortodoncia. El hilo dental y la cinta dental mostraron una eficacia comparable cuando se usaron correctamente, aunque se reportó que la cinta era más cómoda en contactos interproximales estrechos. La adherencia del paciente y la técnica resultaron ser determinantes críticos de la efectividad, independientemente del dispositivo utilizado.

Conclusión: Los cepillos interdetales superan al hilo dental y la cinta en la eliminación de placa y la reducción de la inflamación gingival, especialmente en pacientes con espacios interdetales más amplios. El hilo dental y la cinta siguen siendo útiles para contactos estrechos, pero dependen en gran medida de la técnica. Las recomendaciones individualizadas deben guiar la práctica clínica, considerando factores anatómicos, la destreza manual y la preferencia del paciente. Aún se requieren ECA de alta calidad a largo plazo que comparen directamente el hilo dental, la cinta y los cepillos interdetales para fortalecer las guías clínicas. animal, la conservación de los recursos hídricos y la preservación de la biodiversidad.

Palabras clave: Limpieza Interdental. Cepillo Interdental. Hilo Dental. Cinta Dental. Control de Placa. Salud Periodontal.

1 INTRODUCTION

Dental plaque is a highly organized biofilm composed of bacteria embedded in an extracellular matrix that adheres firmly to tooth surfaces (Marsh, 2005). If not effectively disrupted, plaque is the primary etiological factor in the development of gingivitis and periodontitis (Löe, Theilade, & Jensen, 1965). While toothbrushing with fluoride toothpaste remains the cornerstone of daily oral hygiene, it is estimated to remove only approximately 60% of total plaque, leaving interproximal and subgingival areas insufficiently cleaned (Van der Weijden & Slot, 2011). Consequently, adjunctive interdental cleaning methods are critical for maintaining periodontal health.

Traditionally, dental floss has been regarded as the gold standard for interdental cleaning. Floss mechanically disrupts biofilm when used with proper technique, reducing gingival inflammation and interproximal caries risk (Chapple & Van der Weijden, 2019). However, its efficacy is highly dependent on patient compliance and manual dexterity, with many individuals particularly children, older adults, and those with orthodontic appliances or motor limitations, failing to achieve consistent results (Imai et al., 2021).

Dental tape, a broader and flatter variant of floss, was developed to improve comfort and effectiveness in tight interproximal contacts. Although clinical trials directly comparing floss and tape remain scarce, preliminary evidence suggests similar plaque control efficacy, with tape being better tolerated in specific anatomic conditions (Ide, 2016).

In contrast, interdental brushes have gained strong support in recent decades. Systematic reviews and meta-analyses have consistently shown that interdental brushes are superior to floss in reducing gingival inflammation and plaque scores, particularly in patients with periodontal attachment loss or enlarged interdental spaces (Serrano et al., 2020; Worthington et al., 2019). Moreover, patient-reported outcomes suggest higher acceptance and adherence to interdental brushes compared with floss (Poklepovic et al., 2013). Despite this growing evidence, floss and tape remain widely recommended in daily practice, often as a first-line adjunct to brushing, while interdental brushes are reserved for specific patient populations. This discrepancy underscores the need for a critical synthesis of the comparative efficacy, applicability, and patient-centered outcomes of these three devices.

The present systematic review aims to evaluate and compare the effectiveness of interdental brushes, dental floss, and dental tape in plaque removal, gingival inflammation reduction, and patient adherence, with the ultimate goal of informing evidence-based recommendations for clinical practice and future research.

2 METHODOLOGY

2.1 PROTOCOL AND REGISTRATION

This systematic review was conducted according to the PRISMA 2020 guidelines (Page et al., 2021). The protocol was prospectively developed and archived internally but was not registered in PROSPERO, as the scope included both systematic and narrative synthesis of clinical outcomes.

2.2 DATABASES AND SEARCH STRATEGY

A comprehensive electronic search was performed in PubMed/MEDLINE, EMBASE, Cochrane Library, and Scopus, covering all records up to August 2025. The search strategy combined MeSH terms and free-text words related to interdental cleaning methods: (“interdental brush” OR “proximal brush” OR “interproximal brush”) AND (“dental floss” OR “flossing” OR “dental tape”) AND (“plaque control” OR “biofilm” OR “gingivitis” OR “periodontal disease” OR “periodontitis” OR “periodontal health”).

Boolean operators (AND/OR) were adapted for each database. No language restrictions were applied initially, but only studies published in English, Spanish, or Portuguese were included for full-text analysis.

2.3 INCLUSION CRITERIA

1. Study design: Randomized controlled trials (RCTs), controlled clinical trials, systematic reviews, and meta-analyses.
2. Population: Adolescents and adults (≥ 12 years), with or without periodontal disease, orthodontic appliances, or prosthetic restorations.
3. Interventions: Interdental brushes, dental floss, or dental tape, alone or in combination with toothbrushing.
4. Comparators: Any of the included devices, toothbrushing alone, or other interdental aids.

2.4 EXCLUSION CRITERIA

1. Case reports, expert opinions, and narrative reviews.
2. In vitro or animal studies.
3. Studies without direct comparison between interdental cleaning devices.
4. Publications without quantitative or qualitative clinical outcomes.

2.5 STUDY SELECTION AND DATA EXTRACTION

All retrieved references were imported into Zotero for management and duplicate removal. Titles and abstracts were independently screened by two reviewers. Full texts of potentially eligible studies were assessed against the inclusion/exclusion criteria. Disagreements were resolved by discussion and, if necessary, by a third reviewer.

3 RESULTS

3.1 PLAQUE CONTROL

Interdental brushes consistently demonstrated superior efficacy in reducing interproximal plaque compared to dental floss and dental tape. In a study by Gennai et al. (2022), interdental brushes and rubber interdental picks were more efficient than toothbrushing alone and toothbrushing combined with floss in reducing plaque and gingival inflammation. Similarly, a study by van der Weijden et al. (2021) found that a rubber bristles interdental cleaner, when used as an adjunct to toothbrushing, was more effective than other interdental cleaning devices and toothbrushing alone in reducing plaque and gingivitis parameters.

Dental floss and dental tape showed comparable efficacy in plaque control when used correctly. However, their effectiveness is highly technique-dependent. A study by da Silva and Henriques (2023) compared the efficacy of dental tape, Flosser®, and Superfloss® in controlling interproximal biofilm. The results indicated that all three methods were effective in plaque control, but the success was contingent upon proper technique and patient compliance.

3.2 GINGIVAL INFLAMMATION

Interdental brushes also proved more effective in reducing gingival inflammation compared to dental floss and dental tape. A systematic review by Sälzer et al. (2015) reported a significant reduction in gingival inflammation when interdental brushes were used as an adjunct to toothbrushing. Dental floss and dental tape were effective in reducing gingival inflammation but to a lesser extent than interdental brushes. The reduction in inflammation was closely linked to the technique and consistency of use.

3.3 PATIENT ADHERENCE AND COMFORT

Patient adherence and comfort were critical factors influencing the effectiveness of interdental cleaning devices. Interdental brushes were generally well-accepted by patients, especially those with larger interdental spaces or compromised manual dexterity. A study by Worthington et al. (2019) highlighted that patient adherence was higher with interdental brushes compared to dental floss, particularly in individuals with periodontal disease.

Dental tape was reported to be more comfortable for patients with tight interproximal contacts, potentially improving adherence in such populations. However, its effectiveness was still highly dependent on proper technique and patient compliance.

3.4 SUMMARY OF FINDINGS

Table 1

From the authors

Device	Plaque Control	Gingival Inflammation	Patient Adherence	Comments
Interdental Brushes	High	High	High	Superior efficacy, especially in larger interdental spaces and periodontal patients.
Dental Floss	Moderate	Moderate	Moderate	Effective when used correctly; highly technique- and compliance-dependent.
Dental Tape	Moderate	Moderate	Moderate	Comparable to floss; more comfortable in tight contacts; may improve adherence.
Oral Irrigators	Low	Low	Variable	Possible reduction in gingival inflammation; inconsistent plaque removal; use dependent on patient motivation.

4 DISCUSSION

The findings indicate that interdental brushes are generally the most effective adjunct to toothbrushing for plaque control and gingival inflammation reduction. Their mechanical design allows efficient removal of interproximal biofilm, particularly in patients with larger interdental spaces or compromised periodontal conditions. Dental floss and tape remain valuable tools, especially for tight contacts where brushes may not fit. However, their efficacy is highly dependent on patient skill and motivation, highlighting the importance of individualized oral hygiene instruction. Dental tape may offer a comfort advantage in narrow spaces, potentially improving compliance.

Patient-centered factors, including dexterity, manual skill, and preference, are crucial in selecting an interdental cleaning device. Clinicians should consider anatomical conditions, patient adherence likelihood, and practical usability when recommending interdental aids. Overall, while interdental brushes outperform floss and tape in clinical outcomes, all devices can contribute meaningfully to periodontal health when used correctly and consistently. Future high-quality, long-term RCTs directly comparing these devices are needed to strengthen evidence-based clinical guidelines.

Furthermore, the integration of patient education and behavioral strategies is essential to maximize the benefits of any interdental cleaning device. Even the most effective tools can fail if patients lack proper instruction or motivation. Personalized oral hygiene programs that include demonstrations, feedback, and reinforcement may enhance technique and adherence, particularly in populations with reduced dexterity or complex dental restorations. Additionally, considering patient preferences and comfort can improve long-term compliance, ultimately translating into more consistent plaque control and better periodontal outcomes. This underscores that device selection should not only be guided by clinical efficacy but also by practical feasibility and patient-centered factors.

5 CONCLUSION

Interdental brushes outperform floss and tape in plaque removal and gingival inflammation reduction, especially in patients with larger interdental spaces. Floss and tape remain useful for tight contacts but are highly technique-dependent. Individualized recommendations should guide clinical practice, considering anatomical factors, manual dexterity, and patient preference. High-quality, long-term RCTs directly comparing floss, tape, and interdental brushes are still required to strengthen clinical guidelines.

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