What's new for the clinician – summaries of recently published papers (October 2025)

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1. DOES PROPER FLOSSING PERFORMANCE TRANSLATE INTO EFFECTIVE PLAQUE REMOVAL?

The ritual of brushing our teeth is a cornerstone of daily life, a universally acknowledged pillar of health and social propriety. Yet, for many, this routine focuses solely on the readily accessible surfaces of the teeth, overlooking the critical, hidden landscapes that lie between them. This neglected frontier—the interdental spaces—is where the most common and destructive oral diseases often begin their insidious work. Interdental hygiene, the practice of cleaning between the teeth, is therefore not merely a supplementary step but a fundamental necessity for comprehensive oral health. The evidence supporting this claim is robust and compelling, rooted in a clear biological understanding of oral disease. The sticky, bacterial biofilm known as plaque accumulates relentlessly in these toothbrush-defying spaces, serving as the primary instigator for gingivitis, the inflammation of the gums characterised by redness, swelling, and bleeding. If left unchecked, this condition can progress to periodontitis, a severe and destructive form of gum disease that erodes the very bone supporting our teeth, ultimately leading to tooth loss.

Regarding floss, a systematic review indicated a trend towards reduced plaque levels after one month when flossing was added to toothbrushing, but this did not reach significance (standardised mean difference (SMD) –0.42, 95% CI –0.85 to 0.02; seven trials, 542 participants; $p = .06$). Already at the three-month interval the additional effect of flossing decreased markedly (SMD –0.20, 95% CI –0.36 to –0.04; five trials, 594 participants, $p = .016$), and at six months, flossing was no longer found to have any measurable benefit (SMD –0.13, 95% CI –0.30 to 0.05; $P = .53$; three trials, 487 participants). If dental flossing can only remove plaque to a limited extent, this also explains the findings of a network meta-analysis that assessed the comparative efficacy of various interdental oral hygiene aids focusing on gingival inflammation. Among 22 trials evaluating 10 different types of devices, ranking probabilities indicated that floss had a near-zero probability of being the best interdental cleaning aid. However, the authors emphasized that the unfavourable results for flossing may be due to its technically demanding applicability and that, when used properly, for example in a professional context it could contribute to the prevention of plaque-associated diseases.

Observational studies show that many subjects have considerable difficulty in using dental floss correctly which impacts on its efficacy. Jung and colleagues (2025)[1] reported on a study that sought to answer the question as to whether the limited effect of dental floss described in the literature is due to inadequate instruction and technical performance or actual uselessness.

Methodology

This clinical trial investigated flossing performance through video observation and monitored plaque levels using an intraoral scanner.

Participants were eligible for inclusion if they were at least 18 years old, had a sufficiently healthy dentition, provided written informed consent, and were willing to take part in the study. Exclusion criteria were mental and/or physical disability that could limit the subject's oral hygiene performance, as well as allergies or intolerances to the dental materials used. Further exclusion criteria based on anatomical characteristics or factors interfering with standardised plaque assessment and oral hygiene procedures for all teeth: gingivitis with swelling and bleeding (< grade 3 of the Modified Gingival Index, tooth mobility > 1 (Grace & Smales Mobility Index), recessions with an extension of more than one third of the root length, cavitated carious lesions, gap dentition, absence of permanent teeth (with the exception of third molars and missing premolars due to orthodontic treatment with gap closure), fillings or crowns involving the proximal surfaces with defects that impede the use of dental floss and represent plaque retention sites, fixed orthodontic appliances.

At the first appointment, all included participants were asked to continue their habitual oral hygiene, but to suspend interdental hygiene measures until the next appointment. At the second appointment (T1) one week later, participants first brushed their teeth using their own toothbrush unsupervised. In a dental chair, plaque in both jaws was then disclosed with a foam pellet mixed in water that showed up discoloured plaque. Intraoral scans of both jaws (scan 1) were then performed.

The participants then went into another room equipped with a filming device. The video camera was mounted behind a semi-transparent mirror, which was taped with a transparent colour filter foil to make any red stains on the teeth as invisible as possible. This was to prevent the flossing performance from being affected by the perception of stained plaque. A dispenser with dental floss (Oral-B Essential Floss Mint waxed) was provided and participants were asked to floss in the way they thought was right and how they usually flossed at home (habitual flossing). Flossing performance was filmed unobserved and without a time limit. The remaining plaque was then recorded with intraoral scans (scan 2) after re-staining as described above.

The participants then watched an instruction video that showed in close-up how the floss is correctly guided over the contact point, applied to the mesial and distal tooth surface

of the interdental space and moved in vertical direction. In addition, a systematic procedure was demonstrated, starting in the interdental space of the first and second molars in the upper jaw on the right and then successively reaching every subsequent interdental space up to the interdental space of the two molars in the lower jaw on the right. The participants were asked to practice flossing as instructed for one week.
At the third appointment (T2), the instructed flossing performance were recorded as well as one scan before flossing (scan 3) and one after flossing (scan 4) as described above.

The videos were analysed after all participants had completed all sessions using special software (Interact). All videos were coded exhaustively meaning that every second of the recorded session was annotated for relevant behaviours in slow motion using continuous temporal behavioural sampling. The interdental spaces mesial and distal of the Ramfjord-teeth (16, 21, 24, 36, 41, 44; in total 12 interdental spaces) were analysed.

Criteria of proper flossing performance were taken in part from the Flossing Dexterity Index. These included the number of interdental spaces reached, the movements performed in the interdental spaces, and the adaptation to the mesial and distal sides of the interdental space. An interdental space was defined as reached when the floss passed the contact point, correct movement was coded when vertical movements were performed and correct adaptation when the floss was placed mesially and distally against the tooth surfaces. This was coded dichotomously (yes/no) in each case. A score was calculated from the percentage (decimal numbers) of interdental spaces reached, flossed with vertical movements and with correct adaptation. To describe the overall performance, the individual scores are added together to the flossing performance score (FPS; maximum score 3 = all interdental spaces flossed with correct adaptation and vertical movements). In addition, the duration of flossing was coded and is given in seconds. Duration as well as FPS is given as median [95% CI].

The scans of the upper and lower jaw of a participant of all four time points were aligned processed using MeshLab software. A region of interest (ROI) was constructed and then visually assessed with the following scores: 0: no stained plaque visible, 1: < 50% of the ROI covered with stained plaque, 2: ≥ 50% of the ROI covered with stained plaque. Four areas of each Ramfjord tooth (mesial and distal each oral and vestibular) were assessed. A Proximal Surface Plaque Index (PSPI) was calculated as the mean of all scores. Plaque removal was calculated as difference between PSPI before and after flossing, thus, higher values for this difference indicate more plaque removal, i.e., less plaque remaining after flossing.

Results

The group studied consisted of 37 subjects (30 female, 7 males; 23.1 ± 3.2 years), no drop outs occurred.

The flossing performance score (FPS) for habitual flossing was 2.0 [1.48; 2.54] which increased significantly after instruction (2.83 [2.45; 2.95]; $p < .001$). The score reflects the quality of flossing based on three criteria: percentage of interdental space reached and percentage of interdental spaces with correct floss adaptation and with vertical flossing movements; each rated on a scale from 0 to 1, adding up to a sum sore between 0 (totally imperfect) and 3 (perfect flossing). Almost all participants had reached all interdental spaces already at T1, but the correct technique was only implemented to a limited extent. For habitual flossing, the score for correct adaptation was 0.42 [0.18; 0.73] and for vertical movements 0.64 [0.0; 1.0], both of which improved significantly after instruction (0.92 [0.83; 1.0], $p < .001$ and 1.00 [0.83; 1.00]; $p = .012$; respectively). However, even after instruction, there were still 8 subjects who did not implement the vertical movement in any interdental space and 5 subjects were only able to present the correct adaptation of the floss in less than half of the interdental spaces.

The time for habitual flossing was 60.3 [48.6; 75.6] s and increased to 89.2 [67.0; 108.7] s after instruction ($p < .001$).
The Proximal Surface Plaque Index (PSPI) was 1.29 [1.00; 1.42] before habitual and 1.33 [1.13; 1.46] before instructed flossing with no significant difference between them ($p = .182$). Oral sites had higher PSPI values than buccal sites at all time points (all $p < .01$). Overall, the plaque removal (difference PSPI before/after) was 0.17 [0.04; 0.25] for habitual and 0.21 [0.13; 0.25] after instructed use ($p = .112$). Flossing significantly increased the number of plaque-free areas ($p < .001$ for both habitual and instructed flossing) and reduced the number of areas with a score of 2 ($p < .001$ for both habitual and instructed flossing). In contrast, there was no significant change in the number of areas with a score of 1 ($p = .726$ for habitual and $p = .177$ for instructed flossing)
Flossing performance was not related to plaque scores (difference PSPI before/after) as there was no significant relationship between FPS and PSPI scores after flossing and also no significant relationship between FPS and plaque removal. Similar was true for the time spent for flossing (habitual flossing: $R^2 = 0.011$, $p = .544$; instructed flossing: $R^2 = 0.001$, $p = .825$). However, there was a significant relationship between the PSPI score before flossing and plaque removal and a strong relationship between PSPI scores before and after flossing.

Conclusion

The researchers found that even with correct technique, flossing did not substantially reduce plaque levels.

Implications for practice:

The results align with previous studies questioning the efficacy of flossing and highlight the need for further investigation into interdental cleaning approaches.

REFERENCE

1. Jung K, Böttge B, Kullmann M, Ganss C. Does proper flossing performance translate into effective plaque removal?. Clinical Oral Investigations. 2025 Sep 4;29(9):438.

2. POLYWAVE LIGHT-CURING UNITS (LCUS) COMPARED TO MONOWAVE LCUS FOR THE POLYMERIZATION OF RESIN-BASED COMPOSITES IN RESTORATIVE DENTISTRY: A SYSTEMATIC REVIEW

The performance of resin-based composites, a cornerstone of restorative procedures, heavily depends on the efficiency of light-curing units (LCUs) used for polymerization. Traditionally, monowave LCUs have been the standard, emitting a narrow spectrum of blue light primarily optimized for activating camphorquinone (CQ), the most common photoinitiator in composites. While effective for CQ-based materials, monowave LCUs have limitations in polymerizing composites containing alternative photoinitiators, such as TPO and Ivocerin, which require activation at shorter wavelengths.

Since the advent of light-activated resin composites, light-curing unit (LCU) technology has evolved from quartz-tungsten halogen (QTH) lamps to second- and third-generation light-emitting diode (LED) systems. Third-generation polywave LCUs, incorporating both blue (~450–470 nm) and violet (~400–420 nm) LEDs, were developed to overcome the spectral limitations of monowave devices and enable the activation of a broader range of photoinitiators—including camphorquinone (CQ), TPO, and Ivocerin. This broader emission spectrum makes polywave LCUs particularly relevant for advanced composite systems such as bulk-fill and aesthetic materials formulated with alternative photoinitiators that improve curing depth and aesthetics.

Thus, Polywave light-curing units (LCUs) have become increasingly important in restorative dentistry due to their ability to emit a broader spectrum of light compared to traditional monowave units. This allows them to efficiently activate a wider range of photoinitiators in modern resin-based composites, leading to superior clinical outcomes in many scenarios. Key features of Polywave LCUs include:-

Wider Spectral Output: Polywave LCUs emit light in the 380–550nm range, covering both blue and violet wavelengths. This enables them to activate not only camphorquinone (CQ, absorbs 430–500nm) but also alternative photoinitiators such as TPO, Ivocerin, BAPO, and MAPO, which require violet light.

Improved Polymerization Efficiency: Studies consistently show that polywave LCUs achieve a higher degree of conversion (DC), improved microhardness, and greater depth of cure than monowave units, particularly for composites containing TPO or Ivocerin. For instance, the degree of conversion was reported to be 83.7–92% for polywave LCUs versus 70–81% for monowave ones, and depth of cure reached up to 4.3mm compared to 3.6mm for monowave units.

Enhanced Mechanical Properties: Polywave curing produces stronger and more durable restorations with higher bond strength, especially in bulk-fill or photoinitiator-diverse composites, thereby increasing the longevity and clinical performance of restorations.

Versatility: Because they activate a variety of photoinitiators, a single polywave LCU can be used with a broader range of resin materials, making them highly practical in clinical settings.

However, they do have some important limitations and considerations that clinicians must take note of:-

Thermal Risks: Polywave LCUs tend to produce higher temperatures during curing (temperature rise up to 12°C has been noted), which can pose risks to pulp vitality. Protocol optimization is required to mitigate this effect.

Beam Homogeneity: Due to the arrangement of blue and violet LEDs, the spectral output may not be perfectly uniform, potentially resulting in uneven polymerization if the LCU is not properly positioned.

Colour Stability: No consistent advantage is seen for colour stability, as results vary based on the specific composite formulation. The impact on aesthetics and long-term shade retention may differ with different materials.

Not Always Superior for CQ-only Composites: For composites with only camphorquinone as photoinitiator, both polywave and monowave units tend to perform equally well. The polywave advantage is most apparent for photoinitiator-rich composites.

Fernández Godoy and colleagues (2025)[1] reported on a systematic review that sought to compare the performance of polywave and monowave light-curing units (LCUs) in the photoactivation of resin-based composite materials, with a specific focus on three key polymerization parameters: degree of conversion (DC), microhardness, and depth of cure (DoC). The null hypothesis of this review is that there are no significant differences in polymerization performance between polywave and monowave LCUs with respect to DC, microhardness, and DoC.

Methodology: The methodology adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and was registered in PROSPERO, ensuring methodological transparency, reproducibility, and systematic rigor.

This review aimed to evaluate how polywave light-curing units (LCUs) compared to monowave LCUs in terms of polymerization efficiency, specifically assessing the degree of conversion (DC), microhardness, and depth of cure (DoC) in resin-based composite materials.

The **PICO** question was as follows: The **population** of interest comprised resin-based composites containing either conventional photoinitiators, such as camphorquinone, or alternative photoinitiators, such as TPO and Ivocerin. The **intervention** under analysis was photoactivation using polywave LCUs, while the **comparator** was photoactivation using monowave LCUs. The primary **outcomes** included DC, microhardness, and DoC, measured through standardised in vitro laboratory methods such as Fourier-transform infrared spectroscopy (FTIR), Raman spectroscopy, Vickers or Knoop hardness testing, and assessments based on ISO 4049 protocols. Only in vitro experimental studies that directly compared the polymerization performance of polywave and monowave LCUs were eligible for inclusion.

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A comprehensive literature search was conducted across five major electronic databases: PubMed/MEDLINE, Scopus, Web of Science, Cochrane Library, and EMBASE. The search strategy was constructed to identify studies evaluating the comparative performance of polywave and monowave LCUs in restorative dentistry, with no restrictions applied regarding language. The search included articles published up to December 2024.

In addition to the electronic database search, a manual screening of the reference lists of all included articles and a targeted hand search of relevant journals were conducted. Furthermore, grey literature sources including Google Scholar and institutional repositories were consulted. However, no additional eligible studies were identified through these manual or grey literature searches.

The study selection process was conducted in two phases by two independent reviewers (AC and RC) using pre-defined eligibility criteria. Firstly, titles and abstracts were independently screened for relevance. Records that clearly did not meet the inclusion criteria were excluded. Then, full texts of potentially eligible studies were retrieved and independently assessed by both reviewers. In cases where discrepancies arose during either phase, these were resolved through discussion. If consensus could not be reached, a third reviewer (EF) was consulted to adjudicate and make a final decision.

For inclusion, studies were required to compare the performance of polywave a nd monowave light-curing units (LCUs) in restorative dentistry and to report quantitative assessments of at least one of the following polymerization outcomes: degree of conversion (DC), microhardness, or depth of cure (DoC). Only studies that employed standardised evaluation techniques were included.

Studies were excluded if they lacked detailed information on light-curing parameters, such as irradiance, exposure time, or wavelength range. Studies that were narrative reviews, conference abstracts, non-peer-reviewed literature, and studies investigating non-dental applications of LCUs were also excluded.

Two independent reviewers extracted data from the included studies using a standardised Excel spreadsheet. Given that all included studies were in vitro experimental investigations, the Risk of Bias for Dental Materials (RoBDEMAT) tool was applied to evaluate internal validity. This instrument, specifically designed for preclinical research in dental materials, assesses multiple domains including randomization (when applicable), blinding of evaluators, sample size justification, appropriateness of statistical analyses, standardization of specimen preparation, and reproducibility of testing conditions.

Each study was rated across these domains and assigned an overall risk of bias classification: low, moderate, or high. The results were summarized in tabular format. Studies with high risk of bias were subjected to additional scrutiny to assess their potential influence on the strength and consistency of the review's findings.

Due to the substantial methodological heterogeneity among the included studies particularly in terms of composite formulations, photoinitiator types, curing protocols, and measurement techniques—a meta-analysis was not feasible. Instead, a narrative synthesis was conducted. Studies were grouped and analysed according to the three primary outcomes: degree of conversion (DC), microhardness, and depth of cure (DoC). Within each outcome category, results were stratified based on key variables such as composite type (e.g., bulk-fill vs. conventional), photoinitiator system (e.g., camphorquinone, TPO, Ivocerin), and the characteristics of the LCU used (e.g., irradiance, spectral emission). Heterogeneity was qualitatively evaluated by comparing study methodologies, experimental conditions, and reporting formats. Where applicable, ranges and percentage differences between polywave and monowave LCUs were reported to highlight trends and variations across studies.

Results

From an initial pool of 1,326 articles identified through electronic database searches (PubMed, Scopus, Web of Science, Embase, and Cochrane Library), 26 studies that met the inclusion criteria were selected for final analysis.

The included studies primarily focused on the in vitro performance of polywave and monowave light-curing units (LCUs) in the polymerization of resin-based composites. Among the 26 analysed studies, 14 specifically evaluated the degree of conversion (DC), 12 assessed microhardness, and 10 investigated depths of cure (DoC) using ISO-based or indirect methods.

Colour stability was found to be more influenced by the resin formulation—particularly the presence of hydrophilic monomers like TEGDMA—than by the spectral output of the light-curing unit. Marginal adaptation was shown to be influenced by both the composite formulation and the spectral compatibility of the curing unit Additional parameters explored included colour stability, heat generation and marginal adaptation.

Most studies exhibited low risk of bias for control group presence, standardization, testing procedures, and outcome reporting. However, recurrent issues were observed in domains related to randomization (D1.2), sample size justification (D1.3), and operator blinding (D3.2), which were frequently marked as "not reported" or "insufficient." These methodological deficiencies indicate a variable internal validity among studies and justify the cautious interpretation of aggregated findings.

Conclusions

Polywave LCUs show advantages in curing composites with alternative photoinitiators like TPO and Ivocerin, particularly in bulk-fill and high-viscosity materials, while monowave LCUs remain suitable for CQ-based resins. Nevertheless, their clinical use requires protocol optimization to manage irradiance variability and mitigate thermal risks.

Implications for practice

This review highlights the importance of matching the spectral output of light-curing units (LCUs) with the photoinitiators used in composite resins. Polywave LCUs showed superior outcomes in degree of conversion, microhardness, and depth of cure especially in composites containing TPO or Ivocerin. However, their higher thermal emission and beam non-uniformity may pose clinical challenges. Selecting an appropriate LCU should consider the composite's photoinitiator system and cavity depth to avoid under-curing and ensure restoration longevity. These findings support a more tailored, evidence-based approach to light-curing in contemporary restorative dentistry.

REFERENCE

1. Fernández Godoy, E., Chaple Gil, A., Caviedes Thomas, R. *et al.* Efficiency and limitations of polywave light-curing units in restorative dentistry: a systematic review. *Clin Oral Invest 29,* 384 (2025). https://0-doi-org.innopac.wits.ac.za/10.1007/s00784-025-06457-4