American Impact Review

Review Article

Behavioral preparation for awake oral hygiene and calculus reduction in dogs

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OPEN ACCESS

Citation:
Valeriia Gerasimova (2026). Behavioral preparation for awake oral hygiene and calculus reduction in dogs. *Am. Impact Rev.* 10.66308/air.e2026078

Received: August 14, 2026
Accepted: September 16, 2026
Published: September 18, 2026

DOI:
10.66308/air.e2026078

ISSN: 3071-124X

Abstract

Background: Daily oral hygiene is recommended for dogs, yet its delivery depends on the animal accepting repeated mouth handling. Concerns about anesthesia also lead owners to seek awake cleaning, although this term covers interventions with different purposes and evidence bases.

Objective: To examine evidence for behaviorally supported oral hygiene without sedation, including whether repeated care can reduce existing calculus, and to distinguish these outcomes from those of professional periodontal treatment.

Methods: A structured narrative review integrated canine oral-hygiene trials, behavioral studies, and veterinary dental guidelines. Targeted searches of Europe PMC and verification against full texts and publisher records were updated on September 18, 2026. Evidence was classified by initial dental status, intervention, treatment frequency, outcome, and examination conditions. No pooled effect estimate was calculated.

Results: Controlled and longitudinal studies support regular awake brushing for plaque control and improvement of visible gingival inflammation. A controlled greyhound study demonstrated reduced visible calculus scores without preliminary scaling, while a trial in unscaled client-owned dogs found partial reductions in combined dental deposits with selected homecare regimens. Daily manual or ultrasonic brushing and textile cleaning also improved plaque and gingival indices in beagles, with declining behavioral stress scores over time. However, calculus findings varied across studies. A recent pilot found no visible calculus reduction after a single ultrasonic-toothbrush session in live dogs. These results do not establish the effectiveness of awake ultrasonic scaling or equivalence to comprehensive dentistry under anesthesia.

Conclusions: Behavioral preparation can support sustainable awake oral hygiene. The defensible clinical objectives are regular plaque removal, improved tolerance, and, in some settings, partial reduction of visible calculus. Established periodontal disease requires veterinary assessment; successful handling does not replace diagnostic access, analgesia, or airway protection.

Keywords: dogs, cooperative care, desensitization, oral hygiene, tooth brushing, dental calculus, ultrasonic toothbrush, animal welfare

1 Introduction

Oral hygiene in dogs is a repeated interaction between an animal and a caregiver. A toothbrush can disrupt plaque only when it reaches the relevant tooth surfaces often enough, and this depends on how the dog responds to handling. Veterinary guidance therefore places home care alongside professional examination and treatment rather than treating either as a complete solution by itself [1]. The practical difficulty is substantial. In a large Swedish questionnaire study, approximately one quarter of responding owners reported difficulty

inspecting their dog's teeth, commonly because the dog did not cooperate [2]. An instruction to brush is consequently incomplete if the owner cannot lift the lip, approach the mouth, or maintain comfortable contact.

Behavioral preparation addresses this obstacle. Gradual exposure, reward-based learning, and predictable pauses can help an animal tolerate routine care [3]. For groomers and veterinary teams, the relevant question is how these principles can make appropriate hygiene procedures more accessible without increasing fear or overlooking disease. This is particularly important in dogs with previous adverse handling experiences. A successful approach must account for the dog's behavior and the condition of the tissues being handled. Training an animal to accept a procedure does not establish that the procedure is clinically suitable.

The phrase anesthesia-free dental cleaning obscures several different interventions. It may mean brushing healthy teeth, wiping accessible surfaces, using an ultrasonic toothbrush, or removing hard deposits with a scaler. These activities differ in their mechanisms, risks, and intended outcomes. Published studies of awake oral hygiene nevertheless provide more encouraging findings than a simple assertion that nothing useful can be done without anesthesia would suggest. Improvements in plaque, visible gingivitis, and some measures of existing dental deposits have been reported after repeated care [4-6]. The scientific task is to identify precisely what improved and under which conditions.

This review examines three questions. First, what outcomes can regular oral hygiene achieve in conscious dogs without sedation? Second, does the evidence extend from preventing calculus accumulation to reducing deposits already present? Third, how should behavioral preparation be incorporated without presenting it as a substitute for comprehensive veterinary dentistry? The focus is on evidence relevant to sustained, welfare-conscious care, including the contribution a skilled groomer may make through habituation, owner education, observation, and referral. No proprietary technique, individual practitioner's success rate, or new patient series is evaluated. Figure 1 summarizes the proposed relationships and the outcome domains that must be assessed separately.

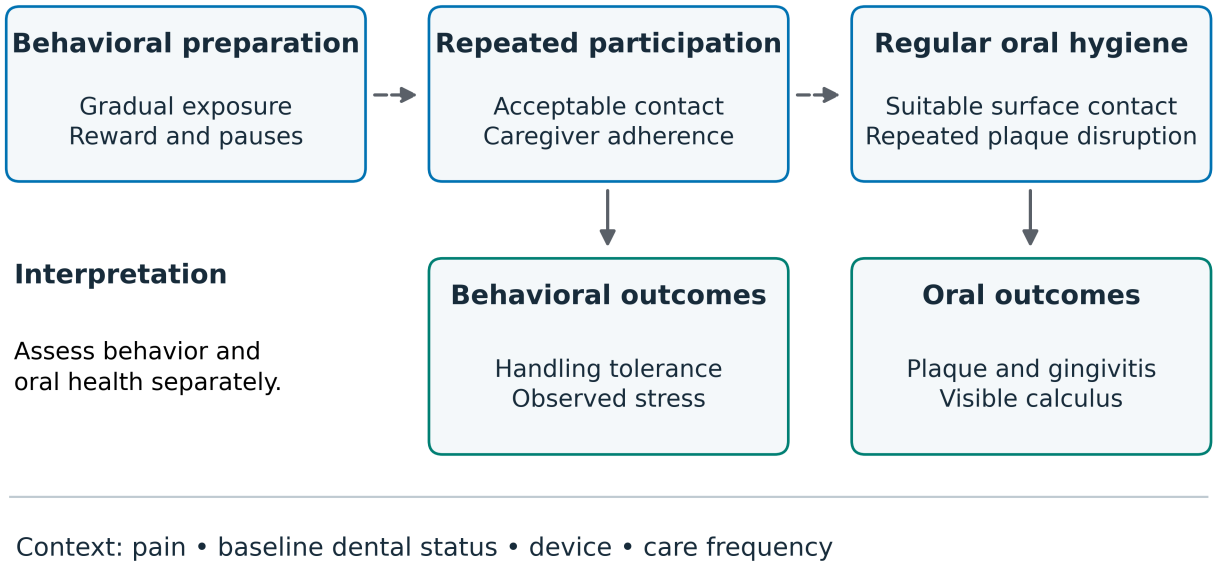

Figure 1. Behavioral preparation and separate outcome domains. Conceptual synthesis of the reviewed literature [3-6,9,13-16]. Dashed arrows indicate proposed enabling relationships, not estimated causal effects. Solid arrows identify outcome domains for assessment. Improved handling tolerance does not establish periodontal health; the contribution of a standardized preparation program beyond repeated brushing remains unquantified.

2 Materials and methods

2.1 Review design and scope

A structured narrative review was selected because the questions combine oral-health interventions, behavioral feasibility, and clinical boundaries. The sources include controlled trials, longitudinal studies, an owner survey, a behavioral review, and professional guidelines. Their outcomes are not interchangeable, and their populations range from teaching beagles to racing greyhounds and client-owned dogs. A numerical synthesis would conceal important differences in baseline dental status and measurement. The review therefore uses qualitative comparison, with attention to the transparency and scientific reasoning emphasized by the Scale for the Assessment of Narrative Review Articles, SANRA [7]. No systematic-review registration, exhaustive retrieval, independent duplicate screening, or meta-analysis is claimed.

The evidence base was updated on September 18, 2026. Europe PMC was used for targeted retrieval of indexed records and accessible full texts. Exact-title and DOI searches were used to verify selected references. Publisher records and official veterinary-association material supplemented these searches. Queries combined dog or canine with ultrasonic toothbrush, tooth brushing and calculus, conscious or awake and calculus or scaling, dirty tooth, anesthesia-free, non-anesthetic, and professional outpatient preventive dentistry. Further searches addressed brushing in article titles and named behavioral studies. Broad searches were used to identify candidates rather than enumerate every publication; the initial result windows were inspected for relevance. Reference lists in the most relevant oral-care studies informed contextual interpretation.

2.2 Selection and interpretation

Sources were retained when they directly examined canine oral hygiene, measured responses to veterinary handling or training, explained pain-related behavioral difficulties, or defined the requirements of dental treatment. Primary canine studies were prioritized for claims of efficacy. Relevant professional guidelines were treated as clinical guidance, not as intervention experiments. Commercial testimonials, before-and-after advertising, manufacturer efficacy claims without primary study support, and findings from human dentistry alone were not accepted as proof of effectiveness in dogs. Sources were selected for their relevance irrespective of whether their findings favored awake care.

The final reference set contains 20 publications. For empirical oral-care studies, the comparison considered animal population, initial scaling status, intervention frequency, duration, assessor masking, outcome definitions, and whether assessment occurred awake or under chemical restraint. Plaque, calculus, gingival inflammation, bacterial counts, thiol scores, and behavioral responses were considered separately. Full texts were consulted for the principal awake oral-hygiene studies. Where only an indexed abstract was available for a supporting study, interpretation was restricted to its reported design and findings. Detailed results of the anesthesia-free dentistry comparison were likewise interpreted from its indexed abstract, without implying access to the full report.

No numerical risk-of-bias score was assigned. Instead, limitations affecting each inference are stated alongside the result, including small samples, selected cooperative animals, visual scoring, industry support, and the absence of periodontal probing or radiographs. Apparent improvement in a combined deposit score was not reclassified as a calculus-specific effect. Reported within-group changes were distinguished from differences against controls. The practical framework developed below is an interpretation of the literature, not a prospectively validated treatment protocol or evidence that a particular practitioner has reproduced the published outcomes.

3 Results

3.1 Plaque control during repeated awake care

The most consistent evidence concerns repeated plaque disruption. Harvey and colleagues compared four brushing frequencies with an unbrushed control in a randomized, controlled, blinded beagle study using a clean-tooth model [8]. Daily and alternate-day brushing performed better than weekly or fortnightly brushing over 28 days. Because the teeth were initially cleaned, this experiment addresses prevention of accumulation, rather than removal of established calculus. Its practical implication is that occasional access to the mouth is insufficient for the same expected benefit as frequent care. Behavioral preparation must support a repeatable routine rather than a single successful session.

Olsén and colleagues investigated manual brushing, an ultrasonic toothbrush, a nylon glove, and a microfiber cloth over 35 days [4]. Ten beagles received the two toothbrush methods on opposite sides of the mouth; eleven received the two textile methods. Plaque and gingival indices improved across all four methods. Fear, anxiety, and stress scores also declined over the study. These findings connect oral-health improvement with increasing tolerance of repeated care. They do not establish that ultrasound itself caused the improvement: different toothpastes were used, and incidental brush movement could contribute mechanically. The manual condition used an electric toothbrush switched off because the powered device provoked unacceptable reactions during preliminary handling.

A separate study followed 22 beagles through two weeks of daily brushing and a subsequent period without brushing [9]. Plaque, gingival inflammation, and thiol measurements improved during treatment, whereas calculus did not improve significantly. Plaque and gingival indices returned to baseline after two weeks without brushing. Stress scores declined during the brushing period. The reversibility of the benefit is clinically important: an animal's ability to accept continuing care is part of intervention effectiveness. A brief course followed by abandonment should not be expected to provide durable protection.

Microbiological experiments provide supporting, but distinct, evidence. Watanabe and colleagues found lower oral bacterial counts in groups receiving daily brushing after initial scaling, with or without polishing [10]. In a subsequent small study, brushing also limited bacterial proliferation, while toothpaste application alone showed a more restricted effect [11]. These studies support mechanical maintenance after professional cleaning. They are not anesthesia-free scaling studies: initial dental procedures involved sedation, and sedation was also used for sampling. Their outcome was bacterial burden at sampled surfaces, not periodontal attachment recovery. They illustrate why an effective awake maintenance intervention can complement rather than replace an initial veterinary procedure.

3.2 Evidence for reduction of existing calculus

The distinction between preventing new deposits and reducing existing deposits is central to the question posed here. The strongest direct support for the latter comes from a controlled field study of racing greyhounds [5]. Care staff brushed teeth daily, weekly, or not at all for two months, without preliminary scaling. The study reported 160 dogs across six kennels. Mean calculus scores fell from 1.06 to 0.79 with daily brushing and from 0.91 to 0.70 with weekly brushing, while the control mean rose from 0.90 to 0.99. Both brushing groups differed significantly from controls; only daily brushing produced a significant overall gingivitis benefit against controls. These are changes in ordinal visual indices, not percentages of calculus mass removed.

The greyhound result is evidence that repeated awake brushing can reduce visible existing calculus under some conditions. Complete clearance was not achieved. Molars could not be adequately assessed, and the observations did not include probing or radiography. The mechanism of deposit loss was unresolved, with

enzymatic toothpaste and routine husbandry potentially contributing. Excessively fearful dogs were excluded. Consequently, the study supports a bounded claim about partial visible calculus reduction over weeks in a selected population, rather than a claim that a groomer can reliably remove all calculus in one appointment. Figure 2 displays the published baseline and eight-week calculus and gingivitis scores, including their reported variability.

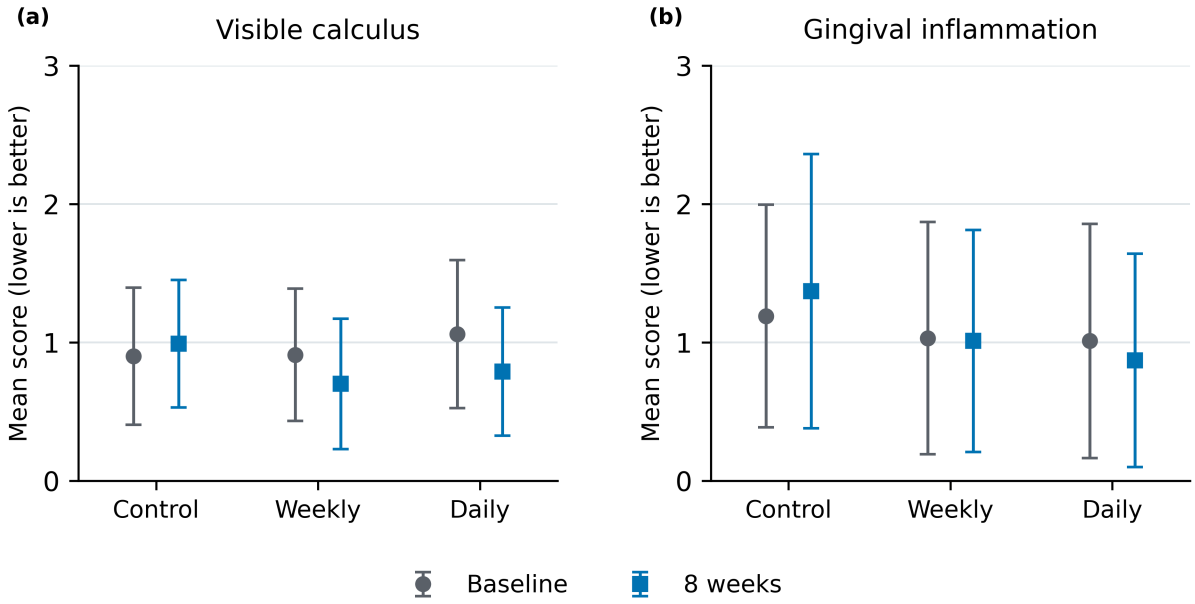

Figure 2. Published oral-health scores before and after eight weeks of brushing. New visualization of means and standard deviations reported in Table 5 of Rooney et al. [5]. The study included 160 greyhounds completing follow-up across six kennels, without preliminary scaling. Markers show means and whiskers show ±1 standard deviation, not confidence intervals. Panels show (a) calculus and (b) gingivitis on the study's 0-3 visual scales. Lower scores indicate less visible calculus or inflammation. The reported whole-mouth indices averaged assessed left-side tooth groups, excluding molars and the lower first premolar. Both brushing groups used enzymatic toothpaste; the graph cannot separate its effect from brushing. No individual data, pooled estimates or new significance tests are presented.

The calculus findings in the 35-day beagle study require particular care [4]. Four dogs showed lower calculus scores, but the Results section reported no statistically significant calculus improvement for any method; the ultrasonic-toothbrush comparison had $p = 0.074$. A sentence in the Discussion describes significance for ultrasound, creating an internal inconsistency. This review follows the explicit statistical results and treats the individual reductions as descriptive observations. Access to rawhide chews, coarse scoring, and the absence of an untreated randomized comparison further limit causal attribution. The study provides useful support for plaque control and adaptation, but only preliminary evidence about calculus reduction.

Gawor and colleagues studied 125 client-owned dogs without initial scaling [6]. Following an eight-week washout, six homecare regimens were compared with a negative control over eight weeks. Brushing every other day, a daily dental chew, and certain combinations reduced combined plaque-and-calculus deposit scores more than the control regimen. The study therefore extends the evidence to unscaled pet dogs. However, plaque and calculus were scored together, so their individual contributions cannot be separated. Only selected combination regimens showed superior change in the reported periodontal-health score, and scoring involved awake visual inspection without instruments or radiographs. Dogs with severe disease or poor acceptance of the interventions were excluded, and the study was industry-funded. The findings support partial deposit

control, not elimination of established periodontitis.

3.3 Ultrasound and the importance of the device

An ultrasonic toothbrush and an ultrasonic scaler should not be grouped as one intervention. The former is a brush-based hygiene device; the latter transmits mechanical vibration through a metal working tip to remove deposits. Evidence from brushing cannot validate a scaling procedure merely because both devices use ultrasound [4,12]. The specific device, its contact with tissue, concurrent toothpaste, treatment duration, and intended outcome must be identified. Otherwise, the intervention described in a claim is different from the intervention tested in the cited paper.

A 2026 pilot directly examined single-session ultrasonic-toothbrush treatment [12]. Seventeen beagles received six minutes of treatment on each of two target teeth, with no visible calculus improvement. The mean calculus index remained 2.2. In a companion experiment involving ten teeth from five cadaver specimens, prolonged application was combined with repeated fingernail scraping. Small fragments detached from seven teeth, but only two had a lower calculus index; one tooth had already lost material before ultrasound began. No deposit detached spontaneously. These findings do not support reliable one-session calculus removal with that toothbrush protocol. They also do not test a metal ultrasonic scaler or negate the separate benefits of sustained plaque control.

The 2021 and 2026 ultrasound studies therefore answer different questions [4,12]. The earlier study tested repeated hygiene and observed plaque and gingival improvement. The later study tested established calculus removal during one prolonged session and found no useful live-animal effect. There is no need to discard either result. A device may be suitable for ongoing hygiene while being ineffective for rapid removal of mineralized deposits. Behavioral tolerance is also a separate outcome: a dog can remain relatively calm during an intervention that does not remove the intended deposit. Figure 3 distinguishes the devices and the limits of transferring evidence between them.

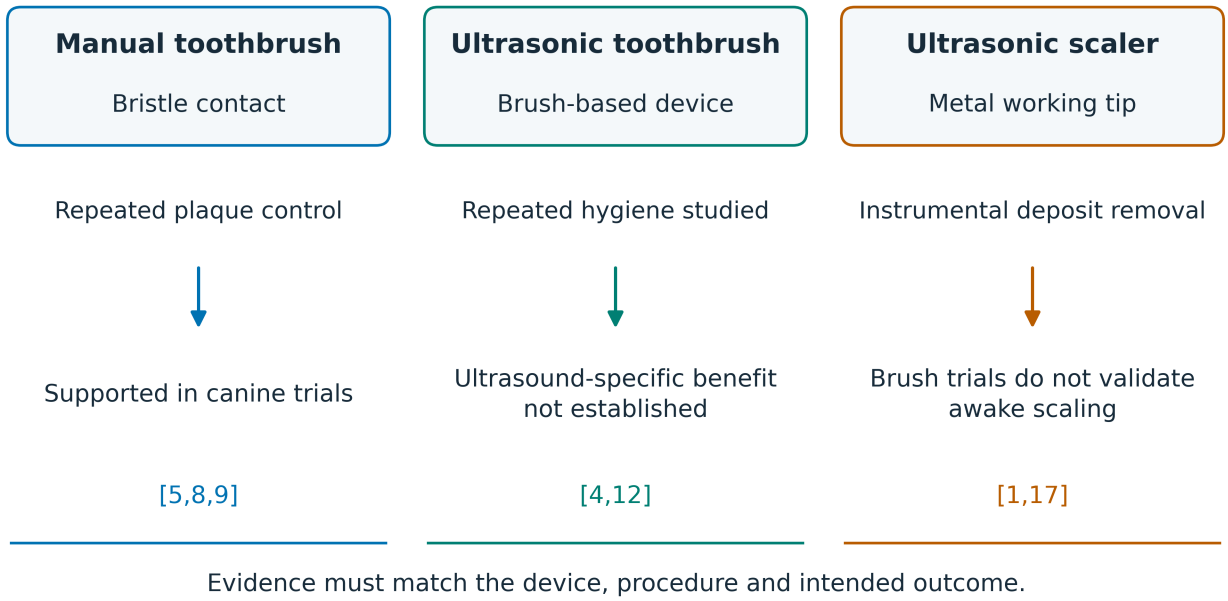

Figure 3. Distinct devices and limits of evidence transfer. Categorical synthesis of device distinctions and evidence discussed in Section 3.3 [1,4,5,8,9,12,17]. The three branches are not an efficacy ranking. Clinical recommendations for scaling cannot be inferred from trials of toothbrushes. No comparative effect size is implied.

3.4 Behavioral preparation and acceptance

The oral-hygiene studies provide direct evidence that repeated handling can become better tolerated, although they do not isolate a standardized cooperative-care protocol [4,9]. Broader behavioral literature helps explain how this might be achieved. Desensitization introduces a stimulus at an intensity the animal can tolerate, while counterconditioning changes its association through pairing with a positive outcome. Cooperative care additionally allows an animal to perform a trained participation behavior and pause the interaction by disengaging [3]. These approaches differ from holding an unwilling dog still until resistance stops. Figure 4 illustrates the brushing schedule and selected published stress scores from the beagle study [9].

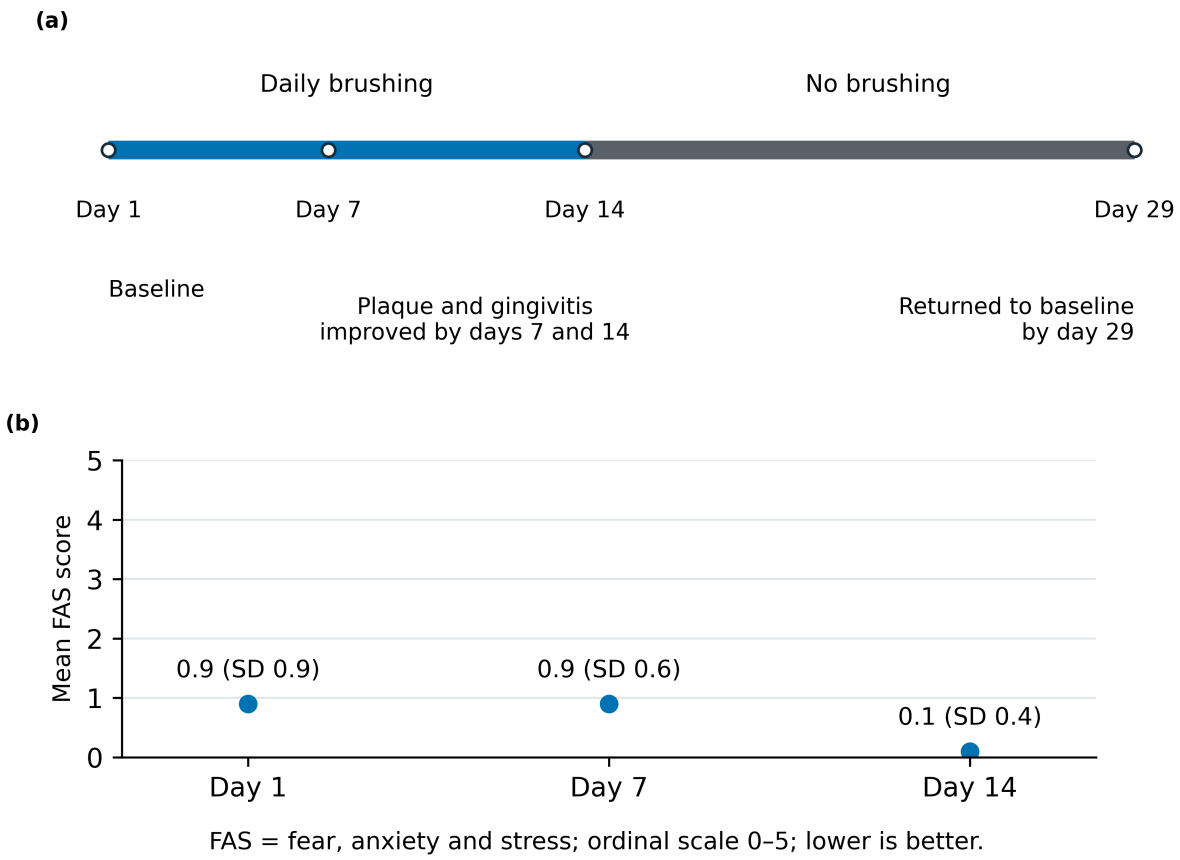

Figure 4. Brushing schedule and selected behavioral observations in beagles. Redrawn from the protocol and reported results of Enlund et al. [9]. Panel (a) shows assessment days 1, 7, 14 and 29 for 22 treated beagles; oral-outcome annotations are qualitative, not effect sizes. Calculus did not change significantly. Panel (b) plots the reported FAS means for selected days, with standard deviations stated in parentheses; dots are group means, not individual dogs. No day-29 FAS value is inferred. Nineteen dogs had prior oral-care experience; controls were not scored for FAS. Declining FAS does not isolate a causal training effect.

Stellato and colleagues tested a four-week desensitization and counterconditioning program for dogs with pre-existing veterinary fear [13]. The final analysis included 15 trained and 22 control dogs. Selected measures favored training, but effects were modest and were not consistent across all behavioral and physiological outcomes. Substantial owner nonadherence and exclusion of noncompliant participants limit interpretation. The study supports the feasibility of modifying aspects of handling-related fear; it does not demonstrate that a short course reliably removes the need for sedation, particularly in severely fearful dogs or during painful procedures.

Owner interaction can also influence the experience of an examination. In a crossover study involving 33 dogs, contact with the owner during a veterinary examination was associated with improvements in selected behavioral and physiological measures compared with the owner's presence without contact [14]. The comparison was not owner presence versus absence, and stress was not abolished. Separately, a study of 92 companion dogs attending training schools associated aversive-based training with poorer welfare measures than reward-based training [15]. Its nonrandomized design and non-dental setting prevent a direct efficacy claim about oral cleaning, but it provides relevant support for avoiding coercive training practices.

Pain complicates every interpretation of noncooperation. Clinical literature describes ways in which pain contributes to avoidance, defensive responses, and other behavior problems [16]. A dog that accepts a brush

near its face but recoils when a particular tooth is approached may have a localized discomfort problem, not a training deficit. Repeated exposure to that contact could worsen the association. Behavioral preparation is consequently conditional on an appropriate health assessment. Its purpose is to make suitable care easier to deliver, not to override a protective response to untreated pain.

3.5 Clinical outcomes beyond visible cleaning

Dental guidelines distinguish preliminary conscious inspection and preventive home care from a complete oral examination and periodontal treatment [1,17]. General anesthesia permits detailed assessment, imaging, and treatment while allowing airway protection and appropriate analgesia. Sedation is not synonymous with general anesthesia and does not automatically provide those functions. For this reason, reporting that a procedure was completed without sedation describes only the drug state. It does not establish diagnostic completeness, absence of pain, or adequate treatment of subgingival disease.

A prospective comparison reported by Niemiec and colleagues included 46 dogs, half with recent anesthesia-free dentistry and half meeting control criteria [18]. Salivary thiol test scores did not show a benefit attributable to the awake procedure, whereas scores improved following anesthetized dental treatment. The allocation was not randomized, entry criteria differed, and only 14 dogs from the prior awake-treatment group subsequently underwent anesthetized procedures. The result is therefore interpreted cautiously. It nevertheless provides direct contrary evidence to treating awake dental cleaning as an established method of periodontal disease control. It does not invalidate preventive brushing, which is a different intervention with a different evidence base.

The reviewed outcomes form a hierarchy of increasing clinical demand. Access to the mouth permits hygiene. Plaque reduction measures an effect on biofilm. A lower calculus index documents a change in visible mineralized deposits. Reduced gingival inflammation is a further outcome, while periodontal attachment and bone support require a different level of assessment. None of these steps can be assumed from the one before it. Table 1 summarizes the principal oral-care studies, and Table 2 distinguishes claims that can be supported from claims that require further evidence.

4 A framework for behaviorally supported oral hygiene

4.1 Defining the objective before handling

The literature supports a practical framework organized around the intended task rather than the absence of medication. The first decision is whether the aim is preventive brushing, familiarization with mouth handling, observation of accessible surfaces, or treatment of suspected disease. These objectives should be documented separately. A routine directed at plaque removal is not a professional periodontal procedure, even when performed by a highly experienced handler. Defining the aim beforehand also allows an incomplete session to be recorded accurately, without turning a small amount of successful contact into a claim of whole-mouth treatment.

For a dog already receiving veterinary dental care, the hygiene objective can be linked to the treating clinician's findings and instructions. For a dog with an unknown dental history, an awake appearance alone should not be treated as clearance for instrumentation. Visible abnormalities or suspected pain warrant veterinary evaluation [1,17]. This distinction is relevant to grooming settings, where regular contact may help identify a change but does not provide access to every surface or root. Observation is valuable when it leads to timely assessment rather than an unverified diagnosis.

The proposed framework separates willingness from suitability. Willingness concerns whether the dog can

participate without escalating distress. Suitability concerns whether the intended contact is appropriate for the animal's oral condition. Both need to be considered; a cooperative dog can have significant dental disease, while a clinically suitable brushing task can still be too difficult behaviorally at a particular visit. This separation prevents calm behavior from being used as a proxy for health and prevents a lack of cooperation from being interpreted automatically as a reason to intensify restraint.

4.2 Establishing participation

Initial preparation can focus on approaching the care area, orienting toward the handler, and briefly accepting non-painful contact away from the mouth. The progression toward lip lifting and brush contact should depend on the individual response rather than a fixed promise of readiness after a given number of visits. Reward-based, graded exposure is consistent with the behavioral literature [3,13]. The exact sequence presented here is a practical synthesis, not a tested prescription with an established success rate. In particular, the available studies do not validate a universal two-visit or three-visit preparation program.

A participation behavior, such as voluntarily resting the chin on a support, can make the interaction more predictable. When the animal withdraws, the handler pauses. Such a signal is useful only if it can actually control the interruption of the activity. It should not be introduced as a promise of choice and then ignored when the dog moves away. The trained behavior also needs to be compatible with the task: access to one visible tooth does not demonstrate readiness for prolonged manipulation farther back in the mouth. Generalization across handlers, locations, and devices should be assessed rather than assumed.

Progress should be described through observable behavior. Useful records include the contact accepted, whether the dog approached voluntarily, avoidance movements, muscular tension, attempts to leave, and the point at which the session stopped. Food acceptance may contribute information but should not be the sole indicator of comfort. A dog can continue eating while showing other signs of conflict. Similarly, stillness can reflect relaxation, freezing, or restraint; the surrounding behavior determines its interpretation [3]. The framework therefore favors repeatable descriptions over unsupported statements that a dog experienced no stress.

4.3 Maintaining a workable hygiene routine

The selected oral-hygiene method should balance evidence of efficacy with the dog's tolerance and the caregiver's ability to use it consistently. A manual brush may be acceptable to a dog that dislikes a powered device. A textile may help some animals become accustomed to contact, although its anatomical reach and evidence base differ from those of a brush [4]. Substitution should be purposeful: a tolerable method that permits repeated plaque removal may be more useful than an abandoned method, but incomplete access still needs to be acknowledged.

Frequency deserves explicit attention. Across the brushing literature, daily or near-daily care generally provides a better basis for gingival health than infrequent cleaning [5,8,9]. A grooming appointment every several weeks cannot be equated with a study in which teeth were brushed every day. Professional demonstrations can nevertheless contribute if the owner can reproduce the task at home. A useful endpoint for an educational session is therefore not merely that the professional completed brushing, but that the caregiver can perform an appropriate version and knows when to stop and seek advice.

Owner communication has evidence of its own. In a three-year study, 75 owners of young dogs were assigned to motivational interviewing, traditional advice, or a control condition [19]. Repeated communication was associated with selected improvements in reported brushing and dental indices, but daily brushing remained uncommon and the effects were small. No superiority of motivational interviewing over traditional advice was

established for dental health. This supports follow-up and practical troubleshooting without promising that education alone will secure adherence. In practice, forgotten routines, handling difficulties, and discomfort require different responses rather than repetition of the same instruction.

4.4 Monitoring and referral

Monitoring should retain separate records for behavior and oral appearance. A dog may accept contact more readily even when calculus is unchanged; another may have less visible plaque while remaining uncomfortable. Combining these observations into a single success label loses information. Photographs can document visible surfaces if angle and lighting are reasonably consistent, but they cannot show every periodontal pocket or exclude disease below the gingival margin. Owners should understand what an image demonstrates and what it does not establish.

An interrupted hygiene session is not necessarily a failure. A pause may preserve tolerability and reveal that the intervention needs adjustment or that a veterinary assessment is overdue. Persistent avoidance, suspected pain, bleeding, a fractured or mobile tooth, swelling, or difficulty eating changes the priority from routine hygiene to clinical evaluation [1,16,17]. A practitioner should not attempt to establish these findings by provoking painful contact. The framework does not specify lay techniques for scaling or subgingival instrumentation; those are outside the evidence-supported home-hygiene task considered here.

When an owner declines anesthesia, the concern should be clarified rather than dismissed. Perceived risk may reflect an earlier adverse event, a dog's concurrent illness, or uncertainty about what anesthesia involves. Individual risk assessment and monitoring are veterinary responsibilities [20]. A tailored discussion may lead to referral, further assessment, modification of a treatment plan, or an interim hygiene strategy. Evidence of benefit from selected homecare regimens can inform that conversation, but owner refusal does not convert an incomplete intervention into an equivalent treatment. Any interim plan should preserve access to reassessment and avoid concealing unresolved disease. Figure 5 summarizes the proposed pathway for routine hygiene, reassessment, and referral.

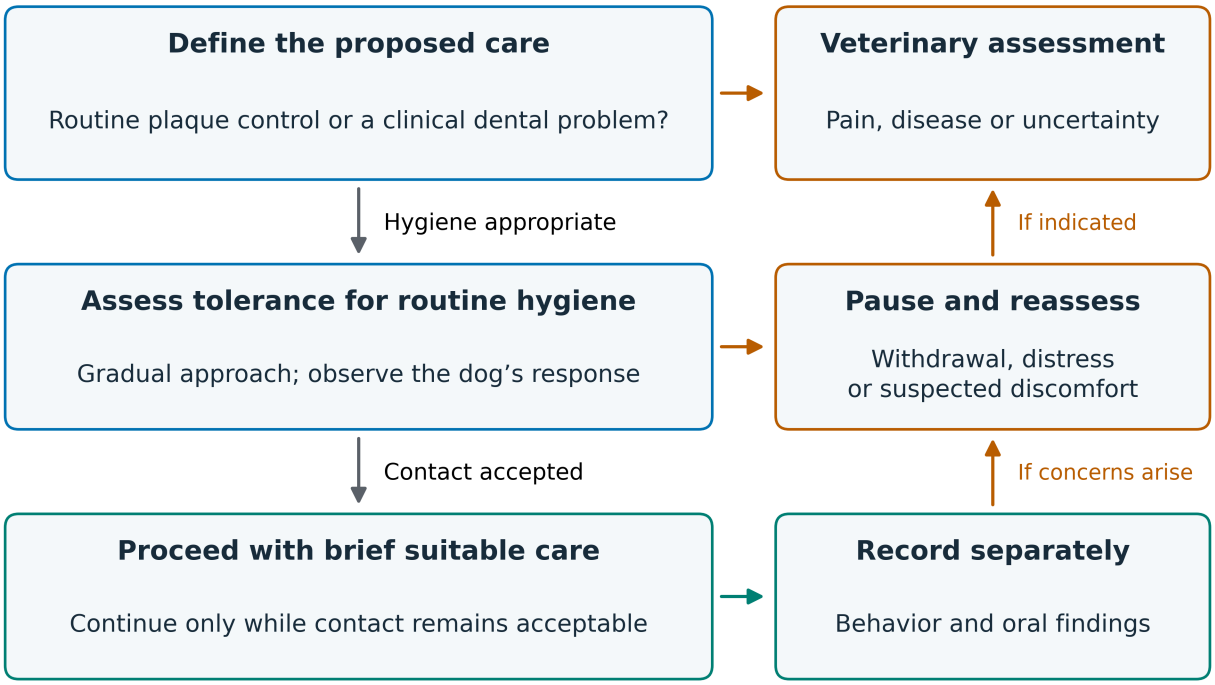

Figure 5. Proposed pathway for routine oral hygiene and reassessment. Practice framework synthesized from behavioral evidence and veterinary guidance [1,3,13,16,17,20]. This is a conceptual decision aid, not a validated screening instrument or authorization to perform dental treatment. Absence of visible warning signs does not exclude disease. Persistent distress or suspected pain requires reassessment; definitive dental diagnosis and treatment planning remain veterinary responsibilities.

5 Discussion

5.1 What the evidence supports

The findings support a positive but specific role for awake oral hygiene. Repeated brushing can improve plaque control and visible gingival health. Some studies also show partial reduction of existing calculus or mixed dental deposits in dogs that were not scaled before treatment [5,6]. It would therefore be inaccurate to state that established visible deposits can never decrease during awake care. Equally, these results should not be expressed as proof of complete calculus removal, treatment of periodontal pockets, or equivalence to comprehensive dental treatment. The effect depends on the intervention and endpoint being described.

The practical contribution of behavioral preparation is to make repeated effective contact more achievable. This is relevant to a professional profile centered on patient handling, gradual familiarization, and sustained care rather than force. Published oral-hygiene studies report both improved dental indices and adaptation over time [4,9], while broader behavioral studies provide qualified support for reward-based methods [13-15]. The proposed connection is plausible and useful, but an important causal gap remains: the literature reviewed does not establish how much additional oral-health benefit comes specifically from a standardized cooperative-care

program beyond the effects of repeated brushing and handling.

This distinction matters for describing an individual practitioner's methods. Similarity to an evidence-based principle is not direct validation of an entire service. The transferable components may include graded exposure, observation of discomfort, appropriate plaque removal, and owner support. A separate claim that a named ultrasonic procedure safely replaces anesthesia would require evidence matching that device, population, procedure, and outcome. A literature review can justify components and generate testable hypotheses; it cannot retrospectively supply clinical data that were never collected for the practitioner's own cases.

5.2 Resolving apparently conflicting findings

Much of the disagreement about awake dental care results from a mismatch between the question asked and the result cited. In clean-tooth studies, the relevant effect is slower accumulation after deposits have been removed. In dirty-tooth studies, a lower score may indicate partial removal, slower additional accumulation, or both. In a single-session experiment, the question is immediate detachment of mineralized material. Finally, a comparison of periodontal treatment asks whether disease-related outcomes improve after a more comprehensive procedure. These designs should not be combined into a single vote for or against care without anesthesia.

The greyhound study offers a useful example [5]. Its observed reduction in calculus scores makes a narrow statement about existing visible deposits defensible. Yet the mean score remained above zero, and the study did not measure all relevant tooth surfaces or periodontal structures. The result should encourage investigation of sustained care, not be expanded into a promise of complete debridement. Conversely, a negative one-session ultrasound result [12] does not show that daily brushing is futile. Maintaining these distinctions allows favorable and unfavorable findings to coexist without selective omission.

Combined outcome measures require similar discipline. A mixed plaque-and-calculus score can be valuable for practical visual assessment, but a reduction may be driven mainly by removable soft plaque [6]. Likewise, an improvement in a score labeled periodontal health is constrained by the examination used to produce it. Without probing or imaging, it cannot establish recovered attachment or bone support. These limitations do not make visual research worthless. They define the level of claim it can support and identify which outcomes a future study must measure more directly.

5.3 Welfare and clinical completeness

Avoiding unnecessary coercion is a legitimate welfare objective, but absence of sedation is not by itself a welfare measure. Relevant outcomes include pain, fear, injury, duration of handling, recovery, and whether required care was delivered. General anesthesia introduces risks that must be assessed and managed, yet it also enables aspects of dentistry that awake cooperation cannot provide [17,20]. A meaningful comparison therefore evaluates the full care episode, including the consequences of leaving disease untreated, rather than comparing drug exposure in isolation.

This also changes how efficiency should be understood. An apparently brief awake procedure may be efficient for removing surface plaque but incomplete for the clinical problem presented. Conversely, several short preparation sessions may be worthwhile if they help an owner maintain an appropriate daily routine for months. The reviewed evidence does not quantify that long-term trade-off or establish a reduction in future anesthetic events. Such benefits should be framed as hypotheses rather than incorporated into marketing or scientific conclusions as established facts.

The distinction between supportive positioning and coercive restraint should be explicit in future reports.

Calling an intervention restraint-free without describing how the dog's head and body were managed prevents readers from evaluating the welfare claim. A complete description should state whether the animal could disengage, whether withdrawal was respected, and whether equipment or personnel restricted movement. The same transparency is needed for sedative or anxiolytic medication. Behavioral and pharmacological support need not be opposites; their appropriateness depends on the animal and the procedure, not on a categorical commitment to avoid one approach.

5.4 Implications for grooming and preventive care

Grooming professionals may encounter an animal more regularly than a veterinary dental team does. That contact creates an opportunity to notice a new aversion to handling, help an owner practice suitable care, and encourage examination when something changes. These are meaningful contributions even when they do not involve treating disease. A preventive model can therefore recognize the groomer's behavioral expertise while maintaining a clear referral relationship. Whether a particular dental activity is permitted in a given setting requires separate consideration; scientific evidence of brushing efficacy does not determine professional authorization.

The most defensible description of such work is specific about its scope. Supporting a dog to accept lip lifting and daily brushing is an observable activity. Teaching an owner a manageable routine is another. Recording that a visible deposit decreased over time is a finding that can be documented with suitable methods. Claims about removing all calculus, treating periodontitis, or making anesthesia unnecessary require different evidence. Clear language protects the scientific value of the practitioner's actual contribution by avoiding conclusions that are broader than the observations.

For owners who otherwise provide no oral care, a feasible hygiene routine may represent a useful improvement, as the unscaled-dog studies suggest [5,6]. However, benefit compared with no care is not equivalent to adequacy compared with recommended treatment. This is especially important when financial constraints or anxiety about anesthesia influence decisions. A transparent interim plan should explain its limited goal, recognize signs that require reassessment, and avoid using cosmetic improvement as reassurance that the mouth is healthy. Repeated care can be constructive without being presented as a definitive solution.

5.5 Research priorities

A future evaluation of behaviorally supported oral hygiene should define both the behavioral intervention and the cleaning method before recruitment. It should distinguish an ultrasonic toothbrush from a scaler, specify the surfaces treated, document baseline dental assessment, and report concurrent oral-care products. If the hypothesis concerns training, both groups should receive comparable oral-hygiene instructions so that differences can reasonably be attributed to the preparation program. If the hypothesis concerns a device, handling support should be comparable across device groups. These design choices address different causal questions and should not be combined implicitly.

Dental and behavioral endpoints should be analyzed separately. Plaque and calculus require distinct measures; a calibrated photographic calculus-area assessment may supplement, rather than replace, established clinical indices. Behavioral outcomes could include approach, withdrawal, completion of predefined contact, and independently coded stress-related behavior. The analysis should retain dogs that cannot complete the intervention as a clinically important outcome. Excluding them after enrollment would make a difficult-dog service appear more feasible than it is. Treatment discontinuation, reasons for referral, and any adverse events should be reported alongside successful sessions.

Follow-up should extend beyond an immediate before-and-after photograph. Relevant questions include

whether owners sustain the routine, how quickly plaque returns after interruption, whether tolerance generalizes to another caregiver, and whether clinical reassessment changes the plan. A claim of calculus removal requires documentation of the original mineralized deposit and its subsequent extent, rather than a combined score alone. A claim of periodontal benefit requires an appropriately complete veterinary examination. Study design and ethical oversight must ensure that needed treatment is not withheld merely to produce an untreated comparison.

The current evidence also leaves important populations underrepresented. Teaching beagles and cooperative trial participants may not reflect very fearful dogs, animals with painful mouths, or dogs with crowded dentitions. A service intended for difficult cases cannot infer its success rate from studies that excluded poor cooperators. Research should document these selection boundaries and evaluate whether a preparation program expands access without prolonging distress. That would provide a more informative test of behavioral expertise than reporting only the number of dogs whose teeth looked cleaner afterward.

5.6 Limitations of the review

This review is selective and narrative. It does not provide an exhaustive account of every dental product, all unpublished research, or every language of publication. Targeted database searches can miss relevant studies, especially when terminology differs or full texts are unavailable. Several detailed oral-care studies come from overlapping research groups, and the total body of evidence should not be mistaken for independent replication of the same protocol. There was no independent duplicate extraction or formal certainty grading. Supporting findings available only in abstracts have correspondingly limited interpretation.

The studies themselves vary in outcome sensitivity, follow-up, masking, sample composition, and commercial involvement. Visual indices can demonstrate surface changes while leaving underlying disease unmeasured. Declining behavioral scores may reflect adaptation, changes in handling, observer expectations, or several influences together. None of the reviewed evidence validates an individual practitioner's protocol. The conclusions concern published intervention categories and the limits of transferring their findings to a behaviorally informed grooming context.

6 Conclusions

Regular oral hygiene can improve plaque control and visible gingival health in awake dogs without sedation. Evidence also supports partial reduction of existing visible calculus in a controlled greyhound study and reduction of combined dental deposits with selected regimens in unscaled pet dogs. Those favorable findings justify a substantive role for sustained care. They do not demonstrate consistent complete calculus removal, validate awake ultrasonic scaling, or establish equivalence to comprehensive dentistry under anesthesia.

Behavioral preparation is most defensible as a means of enabling appropriate repeated contact, reducing avoidable conflict, and helping caregivers maintain care. Its effectiveness should be assessed through both observable participation and the dental outcome sought. A dog's cooperation does not exclude oral disease or replace the clinical functions of anesthesia. An evidence-informed model therefore integrates gradual preparation, regular hygiene, accurate outcome reporting, and timely veterinary assessment, while treating claims about an individual method as questions requiring direct evaluation.

Declarations

Ethics statement. This article reviews published literature. No new animal experiments, human-participant research, or patient-data collection were undertaken for this review.

Data availability. No new experimental dataset was generated. The evidence discussed is identified in the reference list. No individual animal records from the author's practice were used. Figures 2 and 4 replot published summary statistics from Rooney et al. [5] and Enlund et al. [9]; the transcribed values accompany the figure files. Figures 1, 3 and 5 are conceptual syntheses of the cited literature.

Table 1. Principal evidence on repeated oral hygiene and awake cleaning

Study and setting	Intervention and finding	Interpretive boundary
Harvey et al. [8] Beagles	Four brushing frequencies over 28 days. Daily or alternate-day care outperformed less frequent brushing.	Initially cleaned teeth; evidence concerns accumulation, not removal of established calculus.
Olsén et al. [4] 21 beagles	Daily care for 35 days. Manual and ultrasonic brushes and two textiles improved plaque and gingival indices.	Four dogs had lower calculus scores; Results reported no significant calculus effect. Small split-mouth study.
Rooney et al. [5] 160 greyhounds	Eight weeks without initial scaling. Daily and weekly brushing reduced visible calculus scores; daily brushing improved overall gingivitis.	Partial reduction; selected population and restricted visual examination. No periodontal probing or imaging.
Gawor et al. [6] 125 pet dogs	Six regimens versus control over eight treatment weeks. Selected regimens reduced deposits in unscaled dogs.	Plaque and calculus combined. Severe disease and poor cooperators excluded; industry funding.
Enlund et al. [9] 22 beagles	Two weeks of brushing improved plaque, gingival and thiol measures. Plaque and gingival indices rebounded after stopping.	No significant calculus improvement. Short follow-up; behavioral adaptation not isolated experimentally.
Enlund et al. [12] 17 live dogs	One ultrasonic-toothbrush session on two target teeth. No visible calculus reduction.	Different question from daily maintenance; does not test metal ultrasonic scaling.
Niemiec et al. [18] 46 pet dogs	Thiol scores favored anesthetized treatment rather than recent anesthesia-free dentistry.	Nonrandom allocation, different entry criteria, surrogate outcome; interpretation based on indexed abstract.

Study sizes refer to the populations described in the reports, not a pooled sample. Awake visual outcomes do not establish complete periodontal status. Tables summarize the review rather than provide a formal certainty grading.

Table 2. Boundaries of claims about care without sedation

Proposed claim	Evidence-based interpretation	Claim not established
Regular awake brushing works	Supported for plaque control and selected gingival outcomes [4,5,8,9].	Permanent protection after care stops.
Existing calculus can decrease	Partial visible reductions reported under specific repeated-care conditions [5].	Reliable complete removal in every dog or one appointment.
An ultrasonic brush supports hygiene	Plaque and gingival improvements reported with repeated use [4].	An ultrasound-specific advantage or reliable one-session calculus removal [12].
Training supports participation	Adaptation and selected handling benefits reported [4,9,13,14].	Guaranteed comfort or elimination of sedation for all procedures.
Awake cleaning treats periodontitis	Not established by the reviewed homecare evidence [6,17,18].	Equivalence to complete examination and treatment under anesthesia.
Published evidence validates a service	Can support components matching the studied interventions.	Validation of an untested individual protocol or a different device.

These distinctions concern scientific support, not the legal scope of any profession. Veterinary assessment remains necessary when disease or pain is suspected.

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