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ORTHODONTIC RETENTION: A NARRATIVE REVIEW OF CURRENT EVIDENCE ON METHODS, EFFECTIVENESS, COMPLICATIONS AND INDIVIDUALIZED RETENTION PROTOCOLS

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ABSTRACT

Introduction: Maintaining the results of orthodontic treatment after active therapy remains one of the most important challenges in orthodontic practice. Post-treatment changes may result from true relapse of the original malocclusion, but they may also reflect physiological changes in the dentition, periodontal tissues and craniofacial structures over time. For this reason, retention should be considered an integral part of orthodontic treatment rather than an optional final stage.

Objective: The aim of this narrative review is to summarize current evidence on orthodontic retention, with particular emphasis on relapse mechanisms, fixed and removable retainers, clinical effectiveness, complications, adherence to retention protocols and factors influencing individualized retention planning.

Methodology: A structured literature search was conducted in PubMed. Publications concerning orthodontic retention, post-treatment stability, orthodontic relapse, fixed and removable retainers, retainer failure, periodontal effects and retainer wear were considered. Particular attention was given to systematic reviews, meta-analyses, scoping reviews and clinically relevant studies.

Results: Current evidence does not support one universally superior retention method. Fixed retainers provide continuous stabilization and reduce dependence on daily appliance wear, but they are associated with failure, debonding, wire deformation and greater hygiene demands. Removable retainers are easier to clean and monitor, but their effectiveness depends on regular wear. The optimal duration of retention remains uncertain and should be adapted to individual relapse risk.

Conclusions: Retention protocols should be individualized according to malocclusion type, treatment characteristics, age, periodontal status, oral hygiene, risk of relapse, availability of follow-up care and expected adherence.

KEYWORDS

Orthodontic Retention, Orthodontic Retainers, Fixed Retainer, Removable Retainer, Orthodontic Relapse, Post-Treatment Stability

CITATION

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1. Introduction

The completion of active orthodontic treatment does not mean that the therapeutic process has ended. Tooth alignment and occlusal relationships obtained during treatment require stabilization, because periodontal tissues, alveolar bone, the neuromuscular environment and age-related changes in the dentition continue to influence tooth position after appliance removal. Without appropriate retention, teeth may undergo unwanted post-treatment movements, which are commonly described as relapse or loss of post-treatment stability (Lyros et al., 2023; Martin et al., 2023).

Orthodontic retention aims to reduce unwanted post-treatment changes and to maintain functional and esthetic outcomes over time. It should not, however, be viewed as a single standard protocol that can be applied in the same way to every patient. In clinical practice, post-treatment stability depends on several factors, including the original malocclusion, the amount and direction of tooth movement, patient age, growth pattern, soft tissue function, occlusal stability, periodontal condition, oral hygiene and adherence to retention recommendations (Lyros et al., 2023; Martin et al., 2023).

The problem of stability after orthodontic treatment is complex because not every change in tooth position after treatment can be interpreted as true relapse. In some patients, post-treatment changes represent a partial return toward the original malocclusion. In others, they may reflect physiological changes that occur in the dental arches with growth and aging. This distinction is clinically relevant, particularly in the mandibular anterior segment, where crowding may increase over time even in individuals who have never received orthodontic treatment (Lyros et al., 2023).

In everyday orthodontic practice, fixed and removable retainers are the most commonly used retention appliances. Fixed retainers provide continuous retention and do not require the patient to insert the appliance every day. However, their use requires good oral hygiene and regular follow-up, because they may debond, fracture or become distorted (Arn et al., 2020; Aye et al., 2023). Removable retainers, including Hawley retainers and vacuum-formed retainers, are easier to clean and inspect, but their effectiveness depends on regular wear according to the prescribed protocol (Fu et al., 2023; Martin et al., 2023).

Despite numerous clinical studies and systematic reviews, no single retention protocol has been established as optimal for all patients. This is partly due to the differences between available studies, differences in observation periods, variation in outcome measures and the limited number of long-term investigations. The Cochrane review updated in 2023 emphasized that current evidence does not allow strong conclusions regarding the superiority of one retention strategy over another (Martin et al., 2023).

The aim of this narrative review is to summarize current evidence on orthodontic retention, with particular emphasis on relapse mechanisms, fixed and removable retention methods, clinical effectiveness, complications, adherence to retention protocols and practical principles of individualized retention planning.

2. Methodology

This article is a narrative review based on a structured literature search. It was designed to provide a clinically oriented synthesis of current evidence rather than a quantitative summary of treatment effects. Therefore, no PRISMA-based systematic review protocol or meta-analysis was performed.

The literature search was conducted in the PubMed database. The search focused on publications related to orthodontic retention, post-treatment relapse, stability of orthodontic outcomes, fixed and removable retainers, retainer failure, periodontal effects of retention and patient adherence to retention protocols.

The following search terms and their combinations were used: “orthodontic retention”, “orthodontic retainers”, “fixed retainers”, “bonded retainers”, “removable retainers”, “Hawley retainer”, “vacuum-formed retainer”, “Essix retainer”, “orthodontic relapse”, “post-treatment stability”, “retainer failure”, “periodontal health”, “retainer compliance”, “removable retainer compliance”, “orthodontic retainer wear” and “retainer wear time”.

The search included publications available in PubMed up to May 2026, without a strict lower date limit. Particular attention was given to recent publications, especially systematic reviews, meta-analyses and scoping reviews. Older publications were included when they addressed clinically relevant issues, such as adherence to removable retention protocols or objective monitoring of retainer wear time.

The review included publications in English, primarily systematic reviews, meta-analyses, scoping reviews, clinical studies and narrative or critical reviews directly related to orthodontic retention. Particular attention was paid to the Cochrane review on retention procedures after orthodontic treatment (Martin et al., 2023), the systematic review and meta-analysis on failure of fixed bonded retainers (Aye et al., 2023), and

systematic reviews concerning the periodontal effects of fixed and removable retainers (Arn et al., 2020; Quinzi et al., 2023).

Publications were excluded if they were not directly related to orthodontic retention, had limited clinical relevance, described only technical aspects without clear relevance to retention planning or fell outside the scope of this review. Because of the narrative design of the review, no formal risk-of-bias assessment of all included studies was performed and no quantitative synthesis was conducted.

3. Results

3.1. Mechanisms of orthodontic relapse

Orthodontic relapse is multifactorial. It cannot be explained only as a mechanical return of teeth to their pretreatment positions. Post-treatment stability is influenced by biological, functional, growth-related, occlusal and behavioral factors (Lyros et al., 2023; Martin et al., 2023).

One of the most frequently discussed mechanisms involves remodeling of the periodontal ligament and gingival fibers. During active orthodontic treatment, teeth are moved through the alveolar bone, and the supporting tissues must adapt to their new positions. After appliance removal, periodontal and supracrestal gingival fibers require time to reorganize. In the early post-treatment period, these tissues may contribute to tooth movement toward the previous position. This mechanism is particularly relevant after correction of rotations, closure of diastemas and treatment of marked crowding (Lyros et al., 2023).

Soft tissues also play an important role in post-treatment stability. The tongue, lips and cheeks create a balance of forces acting on the dental arches. Abnormal tongue posture, altered muscular function, parafunctions, mouth breathing or persistent oral habits may influence tooth position after treatment. In such cases, mechanical retention alone may not be sufficient if functional factors are not addressed during treatment planning and follow-up (Lyros et al., 2023).

Continued craniofacial growth is another important factor, especially in patients treated during adolescence. Residual mandibular growth, vertical changes and rotational growth patterns may modify dental and occlusal relationships after active orthodontic treatment has been completed. Therefore, retention planning in growing patients should take into account not only the achieved treatment result, but also expected growth-related changes (Lyros et al., 2023).

It is also important to distinguish true relapse from physiological changes in tooth position that occur with age. Mandibular anterior crowding may increase over time even in untreated individuals. For this reason, assessment of post-treatment stability should consider both the tendency toward recurrence of the original malocclusion and the natural variability of the dental arches over time (Lyros et al., 2023).

Relapse risk is not the same in all clinical situations. Rotated teeth, closed spaces, previously crowded anterior segments and cases treated during active growth may require more careful retention planning. Similarly, patients with soft tissue dysfunction or parafunctional habits may need broader management than a retainer alone. These factors support the view that retention should be planned individually and discussed with the patient before active treatment is completed.

3.2. Fixed retainers

Fixed retainers are usually made of a thin wire bonded to the lingual or palatal surfaces of teeth, most commonly in the anterior segment. They may be bonded only to canines or to all anterior teeth. Their main advantage is continuous retention that does not depend on daily appliance insertion by the patient (Lyros et al., 2023; Martin et al., 2023).

Fixed retainers are particularly common in the mandibular arch, where secondary crowding of the incisors is a frequent clinical concern. They may also be useful after diastema closure, correction of rotations, treatment of significant crowding and in patients in whom limited adherence to removable retention is expected. Their effect is especially valuable when maintenance of anterior tooth position requires constant stabilization.

An important advantage of fixed retainers is that patients do not have to remember to wear them. However, this does not mean that fixed retainers are maintenance-free. They require regular clinical monitoring, because they may debond, fracture, distort or become partially damaged. A particular concern arises when the retainer does not detach completely, but becomes partially debonded or deformed. The patient may not immediately notice the problem, while the wire may start to act actively and produce unwanted tooth movement.

Failure of fixed retainers is a clinically relevant problem. Aye et al. (2023) reported in a systematic review and meta-analysis that the overall failure rate of fixed bonded retainers was 35.22% after exclusion of

studies with a high risk of bias. The authors also noted that the risk of failure increased with longer follow-up. These findings show that the clinical effectiveness of a fixed retainer depends not only on its initial placement, but also on material selection, bonding technique, passive adaptation of the wire, follow-up and patient education.

The type of wire and bonding protocol may also influence the long-term performance of fixed retainers. In clinical practice, different wire designs and bonding materials are used. Variations in the bonding surface, composite coverage and wire adaptation may affect durability, hygiene and patient comfort. From a practical perspective, the retainer must be bonded passively, without generating unintended orthodontic forces. Its condition should be assessed during follow-up visits, and patients should be instructed to report any suspected debonding, mobility or change in tooth position.

Fixed retainers are often considered reliable because they do not depend on patient wear. However, their reliability is conditional. A fixed retainer that is distorted or partially detached may be more problematic than no retainer, because it may remain unnoticed and produce unwanted effects. This is why follow-up is an essential part of fixed retention. Patients should also understand that a bonded retainer is not a permanent guarantee of stability, but a device that requires monitoring over time.

3.3. Removable retainers

Removable retainers include mainly Hawley retainers and vacuum-formed retainers, often referred to as Essix retainers. Their common feature is that the patient can remove them, which facilitates oral hygiene and appliance cleaning, but also makes their effectiveness dependent on regular wear (Lyros et al., 2023; Martin et al., 2023).

The Hawley retainer usually consists of an acrylic plate and wire components. It is relatively durable, can be adjusted or repaired and may allow some settling of occlusal contacts after active treatment. Its disadvantages may include reduced esthetics, greater bulk and temporary effects on speech, especially during the initial period of use. For some patients, these factors may reduce acceptance and regular wear.

Vacuum-formed retainers are thin, transparent and generally well accepted esthetically. They cover the teeth and maintain them in a defined position. Their advantages include comfort, esthetics and ease of fabrication. Their limitations include material wear, cracking, discoloration and potential effects on occlusal contacts, particularly when the appliance covers the occlusal surfaces (Ali et al., 2023; Lyros et al., 2023).

Studies comparing Hawley and vacuum-formed retainers have not demonstrated a clear universal advantage of one appliance over the other in terms of long-term stability. Differences may concern comfort, esthetics, durability, cost, patient acceptance and occlusal effects, but appliance selection should be adapted to the clinical situation and patient preferences (Martin et al., 2023).

The main limitation of removable retainers is adherence. Even a well-designed and accurately fabricated retainer cannot be effective if it is not worn as prescribed. For this reason, when removable retention is selected, the clinician should consider the patient's motivation, age, understanding of instructions and likelihood of attending follow-up visits.

Removable retainers also require replacement or adjustment over time. Vacuum-formed retainers may deform, crack or lose their fit, especially if exposed to heat or inappropriate cleaning methods. Hawley retainers may be more durable and repairable, but may be less acceptable esthetically. These practical factors may influence not only patient satisfaction but also long-term adherence.

3.4. Combined retention protocols

Combined retention protocols are frequently used in clinical practice to take advantage of both fixed and removable retainers. A common example is a fixed retainer in the mandibular anterior segment combined with a removable retainer in the maxillary arch. Another option is the use of a fixed retainer in one or both arches together with a vacuum-formed retainer worn periodically, especially at night.

This approach may be useful in patients with a higher risk of relapse, because the fixed retainer maintains anterior tooth position while the removable retainer may support stability of the entire arch. A combined protocol may also provide additional protection if a fixed retainer partially fails, provided that the patient continues to wear the removable retainer regularly.

However, combined protocols should not be used automatically in all patients. A more complex retention plan means more components to monitor, potentially higher costs and more instructions for the patient. If the patient does not understand the purpose of each appliance, adherence may decrease. Therefore, combined retention should be selected on the basis of individual relapse risk rather than clinical habit alone.

The decision to use a combined protocol may be particularly justified in patients after correction of significant crowding, rotations or spacing, in cases where growth-related changes are still expected, or when a fixed retainer is used in a region with high relapse risk but additional arch-wide stabilization is desired. Clear written and verbal instructions are essential in these cases.

3.5. Effectiveness of retention methods

Current evidence does not identify one retention method that is clearly superior for all patients. This is due to differences among studies, including variation in patient groups, malocclusion types, retainer designs, wear protocols, observation periods and outcome measures (Al-Moghrabi et al., 2026; Martin et al., 2023).

Systematic reviews indicate that outcomes assessed in retention studies include tooth position stability, retainer failure, effects on dental and periodontal health and patient satisfaction. Al-Moghrabi et al. (2026) analyzed outcomes assessed in clinical trials concerning orthodontic retention and highlighted considerable variation in outcome measures, as well as relatively limited attention to outcomes important from the patient's perspective. This heterogeneity makes direct comparison of studies difficult and limits the strength of clinical recommendations.

Fixed retainers may be effective in maintaining the position of anterior teeth, especially in the early post-treatment period and in patients at higher risk of relapse. Their effectiveness, however, depends on remaining intact, passive and properly bonded. Removable retainers may provide comparable stability in many clinical situations, but only if they are worn according to the prescribed protocol (Martin et al., 2023).

For Hawley retainers and vacuum-formed retainers, available evidence does not show a clear universal advantage of one method. The choice between them should depend on clinical needs, patient preference, esthetics, comfort, expected adherence and the possibility of follow-up (Lyros et al., 2023; Martin et al., 2023).

It is important to avoid overinterpreting the available evidence. The fact that one method has not been proven superior does not mean that all retainers are equally suitable in every clinical situation. It simply means that the best option depends on the patient and the clinical context. The same retainer may perform well in one patient and poorly in another if relapse risk, oral hygiene, appliance fit or adherence differ substantially.

3.6. Duration of retention

The duration of retention remains one of the most debated topics in orthodontics. In clinical practice, different protocols are used, ranging from retention for several months, through several years, to indefinite or lifelong retention. The lack of definitive recommendations reflects the fact that the risk of post-treatment changes does not disappear shortly after appliance removal (Lyros et al., 2023; Martin et al., 2023).

For removable retainers, many clinicians recommend more intensive wear during the initial post-treatment period, followed by night-time wear. This protocol is practical and acceptable for many patients, but it should not be applied automatically in all cases. Patients treated for severe crowding, rotations, spacing, open bite, Class II or Class III malocclusion, and patients who complete treatment during growth may require longer and more rigorous retention.

Increasingly, orthodontic patients are informed before or during treatment that retention may be long-term. This approach is clinically important because it reduces misunderstanding after active treatment and improves acceptance of retention recommendations. Patients should understand that post-treatment stability depends not only on the quality of active orthodontic treatment, but also on long-term adherence to retention instructions.

The concept of indefinite retention should be communicated carefully. It does not mean that every patient must wear the same appliance in the same way for life. Rather, it reflects the fact that teeth and occlusion continue to change over time and that some form of long-term monitoring or retention may be necessary in selected cases. The retention plan should therefore be realistic, acceptable and adapted to the patient's risk profile.

3.7. Adherence to retention protocols

Adherence to retention protocols is one of the key factors influencing the effectiveness of retention, especially for removable appliances. Regular wear depends on many factors, including patient age, motivation, comfort, esthetics, understanding of instructions, parental support in younger patients and the quality of communication between the clinician and the patient (Fu et al., 2023; Pratt et al., 2011).

A patient who does not understand the purpose of retention may perceive the retainer as an optional accessory rather than a necessary part of treatment. Therefore, instructions at the end of active therapy should

be specific and practical. The patient should know how many hours per day the retainer should be worn, how it should be stored, how it should be cleaned, when follow-up visits are needed and which signs may indicate damage or loss of fit.

In the case of fixed retainers, adherence is also important, although in a different way. The patient does not need to insert the appliance, but must maintain good oral hygiene, report debonding or changes in wire position and attend regular follow-up appointments. Lack of follow-up may allow a minor retainer failure to result in clinically relevant tooth movement.

Studies assessing removable appliance wear have shown that patient-reported wear time may not accurately reflect actual use. Studies using microensors demonstrated that objective monitoring can reveal discrepancies between prescribed wear, reported wear and actual appliance use (Schott et al., 2013; Tsomos et al., 2014). This has implications for both clinical trials and everyday practice.

New technologies, such as microensors, mobile applications reminding patients to wear retainers and digitally designed retention appliances, may improve retention monitoring in the future. However, their routine use requires further evaluation in terms of clinical effectiveness, costs, privacy, patient acceptance and feasibility in daily practice.

Communication remains one of the simplest and most important tools for improving adherence. Written instructions, demonstration of cleaning methods, early follow-up after appliance delivery and clear information about the consequences of retainer loss or breakage may help patients understand their role in maintaining the treatment result.

3.8. Complications and limitations of retention methods

Complications related to retention differ depending on the type of appliance. For fixed retainers, the most commonly discussed problems include difficult oral hygiene, increased accumulation of plaque and calculus, composite debonding, wire fracture and retainer deformation. Systematic reviews indicate that fixed retainers may be associated with greater plaque and calculus accumulation than removable retainers, although periodontal effects depend on oral hygiene, observation time and patient-related factors (Arn et al., 2020; Quinzi et al., 2023).

This does not mean that fixed retainers are contraindicated in all patients. With good oral hygiene and regular follow-up, they may be an effective and safe retention method. Problems are more likely in patients with insufficient hygiene, high calculus accumulation, previous periodontal issues or poor attendance at follow-up visits.

Removable retainers are easier to clean because the patient can remove them from the mouth. However, they may be lost, damaged, distorted by heat or worn irregularly. Vacuum-formed retainers may discolor, crack or wear over time. Hawley retainers may be more durable and repairable, but may be less esthetic and less comfortable for some patients.

For both fixed and removable retainers, patient education is essential. Patients should understand that a retainer is not a device that can be ignored once delivered. Both fixed and removable retainers may require repair, replacement or modification. Delayed reporting of a problem may lead to partial loss of treatment results.

Another limitation concerns the long-term maintenance burden. Retention may require periodic replacement of removable appliances, professional cleaning around fixed retainers, repair of debonded components and long-term follow-up. These aspects should be discussed before the end of active treatment, because they influence patient expectations and acceptance.

3.9. Periodontal considerations

The effect of retention on periodontal health is an important component of long-term evaluation. Fixed retainers, especially in the mandibular anterior segment, may make interdental cleaning more difficult. They often require specific hygiene techniques, such as interdental brushes, super floss or oral irrigators. Patients should receive individualized hygiene instructions according to the type of retainer used.

Systematic reviews addressing the periodontal effects of retainers suggest that interpretation of the evidence is complicated by differences among studies, including variation in periodontal indices, follow-up duration and patient hygiene (Arn et al., 2020; Quinzi et al., 2023). It would be too strong to conclude that every fixed retainer worsens periodontal health. A more practical conclusion is that patients with fixed retainers need careful oral hygiene instructions and regular follow-up.

Removable retainers may be easier to keep clean, but they also require appropriate maintenance. Poor hygiene of removable appliances may promote biofilm accumulation, unpleasant odor, mucosal irritation and reduced comfort. Patients should be advised not to clean vacuum-formed retainers with hot water, because heat may distort the material.

Periodontal assessment should be part of retention follow-up. Particular attention is needed in patients with previous periodontal problems, poor oral hygiene, high calculus formation or limited motivation for maintenance. In such patients, the choice of retainer should balance relapse risk against hygiene capability and periodontal vulnerability.

3.10. Individualized retention planning

Individualized retention planning is a practical response to the limitations of current evidence. Since available studies do not identify a single protocol that is suitable for all patients, clinical decision-making should combine evidence from the literature with an assessment of patient-specific risk factors. This approach is consistent with the cautious conclusions of systematic reviews, which emphasize uncertainty and heterogeneity rather than a universal recommendation (Al-Moghrabi et al., 2026; Martin et al., 2023).

Important clinical factors include the original malocclusion, the amount of correction achieved, the presence of rotations or spacing, mandibular anterior crowding, growth status, occlusal contacts, periodontal condition, oral hygiene and the patient's ability to attend follow-up visits. A patient with previous severe crowding, corrected rotations or closed diastemas may require a different retention approach from a patient treated for a minor alignment problem. Similarly, a patient with excellent hygiene and reliable attendance may be a better candidate for a fixed retainer than a patient with poor plaque control and irregular follow-up.

The choice between fixed and removable retention should therefore be understood as a risk-benefit decision rather than a simple technical preference. Fixed retainers reduce the need for daily patient action, but they increase the need for hygiene and professional monitoring. Removable retainers allow easier cleaning and inspection, but require consistent wear. Combined protocols may be useful when relapse risk is high or when both anterior stabilization and arch-wide retention are desired.

Patient preference should also be considered. Esthetics, comfort, speech, cost and daily routine may influence acceptance of the retention plan. A protocol that is theoretically effective but poorly accepted by the patient may fail in practice. Therefore, shared decision-making and clear explanation of the advantages and limitations of each method can improve the realistic long-term success of retention.

Table 1 summarizes the main characteristics, advantages and limitations of the three common retention methods.

Table 1. Comparison of main orthodontic retention methods

Feature	Fixed retainer	Hawley retainer	Vacuum-formed retainer
Mechanism of action	Continuous stabilization of selected teeth, usually the anterior segment	Stabilization of the dental arch using an acrylic plate and wire components	Coverage of teeth with a transparent thermoformed appliance
Dependence on patient wear	Low for wear, but requires hygiene and follow-up	High	High
Esthetics	Not visible from the labial side	Moderate	High
Hygiene	More difficult around the bonded wire	Easier, removable appliance	Easier, removable appliance
Common problems	Debonding, fracture, wire deformation, plaque and calculus accumulation	Irregular wear, discomfort, speech effects, loss of appliance	Wear, cracking, deformation, discoloration, loss of appliance
Common clinical use	Mandibular anterior segment, diastemas, rotations, higher relapse risk	Arch retention, adjustable appliance, patients accepting acrylic plate	Esthetic removable retention, often maxillary or both arches
Main advantage	Continuous effect independent of daily insertion	Durability, adjustability and repairability	Esthetics, comfort and ease of fabrication
Main limitation	Failure risk and hygiene demands	Esthetics and comfort may be less favorable than clear retainers	Material wear and dependence on regular use

4. Discussion

Available evidence indicates that orthodontic retention requires an individualized approach. At present, no single method can be considered optimal for every patient and every clinical situation. This is related both to the biological complexity of relapse and to limitations in the available evidence (Al-Moghrabi et al., 2026; Martin et al., 2023).

Fixed retainers are clinically attractive because they work independently of the patient's daily decision to insert an appliance. This is particularly relevant in patients with a higher risk of relapse or in those who may not reliably wear removable retainers. At the same time, the effectiveness of fixed retainers depends on correct placement, passive wire adaptation, durability of bonding and regular follow-up. Failure of a fixed retainer may not be immediately obvious to the patient, and lack of monitoring may lead to more serious consequences than in the case of a removable retainer, where loss or damage is usually noticed sooner (Aye et al., 2023).

Removable retainers provide flexibility and easier hygiene, but their effectiveness depends on wear according to instructions. In clinical practice, adherence may decrease as more time passes after active treatment. For this reason, patients should understand that retention is not a short optional addition to orthodontic treatment, but a long-term phase of care (Fu et al., 2023; Pratt et al., 2011).

The duration of retention remains an unresolved issue. Traditional protocols that involve intensive wear initially and night-time wear later are practical, but may not be sufficient for all patients. A high risk of relapse may justify long-term or indefinite retention, especially if the patient accepts such a plan and attends follow-up visits. In patients with a lower risk of relapse and stable occlusion, a less intensive retention protocol may be sufficient. The challenge is that reliable prediction of relapse risk remains difficult.

From a practical perspective, the choice of retainer should be guided by several clinical questions. What was the original malocclusion? Which teeth were moved and to what extent? Is the patient still growing? Are there functional factors that may promote relapse? What is the periodontal condition and quality of oral hygiene? Is the patient likely to follow instructions for removable appliance wear? The answers to these questions should influence the retention plan.

Patient communication is equally important. Retention should be discussed before the end of active treatment, and preferably already during treatment planning. Patients often focus on the moment when the active appliance is removed and may not anticipate that long-term maintenance will be required. Clear communication can reduce frustration and improve acceptance of retention recommendations.

Written instructions are useful because patients may not remember all verbal explanations given at the debonding appointment. The instructions should include information about wear time, cleaning, storage, follow-up visits and management of emergencies such as retainer loss, fracture or debonding. Patients should be advised to contact the orthodontic office promptly if the retainer is damaged or no longer fits, because even short periods without effective retention may lead to unwanted changes in susceptible individuals.

The available evidence also highlights the need for caution when interpreting retention studies. Many studies focus on dental measurements, while aspects such as comfort, esthetics, cost, patient satisfaction and long-term adherence are less consistently assessed. However, these patient-centered factors are highly relevant in practice because a retainer that is technically effective but poorly accepted may not be worn regularly.

Retention is also relevant from the broader perspective of oral health and well-being. Orthodontic treatment is usually undertaken to improve function, esthetics and patient satisfaction, but these benefits may be weakened if the result is not maintained. Loss of alignment may affect not only occlusion and dental appearance, but also the patient's confidence in the treatment process and willingness to seek future dental care.

For this reason, retention should be presented to patients as a shared responsibility between the clinician and the patient. The clinician is responsible for selecting an appropriate protocol, delivering a well-fitting appliance and providing follow-up. The patient is responsible for appliance wear when removable retainers are prescribed, oral hygiene, care of the retainer and timely reporting of problems. This shared model may be more realistic than presenting retention as a purely technical procedure.

4.1. Limitations of available evidence and limitations of this review

Interpretation of studies on orthodontic retention is complicated by considerable differences. Studies differ in the type of retainer used, wear protocols, patient age, malocclusion type, duration of follow-up and methods of evaluating stability. Frequently, the primary focus is the stability of anterior tooth alignment, for example through measurements of crowding or incisor irregularity, whereas quality of life, patient satisfaction, costs, comfort, hygiene effects and long-term periodontal consequences are less often analyzed (Al-Moghrabi et al., 2026).

Another limitation is the relatively short follow-up period in many studies. Post-treatment changes may occur many years after active orthodontic therapy has ended. Therefore, short-term studies cannot always predict true long-term stability.

This article is a narrative review, not a systematic review. A formal quality assessment of all included studies was not performed, and no quantitative synthesis was conducted. These limitations should be considered when interpreting the conclusions. The purpose of the article was to organize current evidence and discuss its relevance to everyday orthodontic practice.

4.2. Clinical implications

Several practical implications can be derived from the available evidence. First, retention should be planned from the beginning of treatment rather than only after appliance removal. The type of malocclusion, the extent of tooth movement and the expected risk of relapse should influence retention planning.

Second, no retention method should be treated as universally best. A fixed retainer may be useful in patients with high relapse risk or expected poor adherence to removable retention, but it requires good hygiene and follow-up. A removable retainer may be sufficient in cooperative patients, but its effectiveness depends on regular wear.

Third, patients should receive clear and practical instructions. These should include appliance wear, cleaning, storage, follow-up schedule and signs requiring urgent consultation. Retention instructions should be written in language that the patient can understand.

Fourth, retention should be monitored long term. Follow-up should include assessment of tooth position, appliance integrity, oral hygiene, periodontal status and signs of retainer failure.

Fifth, combined retention protocols may be considered in cases with a higher risk of relapse, particularly if the patient understands the rationale and accepts the maintenance requirements.

4.3. Practical follow-up and maintenance considerations

Follow-up after delivery of retainers should be planned as part of the retention protocol. The first visit after appliance placement allows the clinician to check fit, comfort, hygiene and patient understanding of instructions. Subsequent visits can be used to detect early changes in tooth position, identify fixed retainer debonding, assess wear or deformation of removable retainers and reinforce hygiene recommendations.

For fixed retainers, follow-up should include careful inspection of each bonding point and confirmation that the wire remains passive. A partially detached or distorted retainer may be difficult for the patient to identify, but clinically important. For removable retainers, the clinician should check appliance fit, material integrity and signs of wear. A retainer that no longer fits passively should not simply be forced into place without evaluation, because it may indicate tooth movement or appliance deformation.

Patient instructions should be practical rather than vague. Patients should be told what to do if a retainer is lost, cracked, distorted, painful or no longer fits. They should also be informed that delaying contact with the orthodontic office may allow relapse to progress. This type of guidance is simple, but it can reduce preventable complications during the retention phase.

In daily practice, the retention plan should be easy for the patient to understand. A complicated protocol may look ideal on paper, but it is less useful if the patient cannot follow it. For example, a patient who travels often, has limited access to follow-up care or has difficulty cleaning around bonded wires may need a different plan than a highly motivated patient with excellent hygiene and regular access to orthodontic appointments. These practical details do not replace scientific evidence, but they help translate the evidence into a plan that can actually work outside the clinic.

A useful approach is to give patients a simple written summary after debonding. This summary can include the type of retainer used, the recommended wear schedule, cleaning instructions, warning signs and the date of the next follow-up visit. Patients should also be told that retainers may need repair or replacement over time. Presenting retention in this way makes the plan more predictable and may reduce anxiety if a problem occurs. It also emphasizes that maintaining the result is a shared process, not a one-time procedure completed on the day the active appliance is removed.

4.4. Future research directions

Future studies on orthodontic retention should include longer follow-up periods, more standardized outcome measures and greater emphasis on outcomes that matter from the patient's perspective. These include not only whether teeth remain stable in model-based or digital measurements, but also comfort, esthetics, speech effects, ease of hygiene, costs, satisfaction and acceptance of long-term retention.

Further studies are also needed to compare retention protocols in patient groups with different relapse risks. Such research could support more personalized clinical recommendations. Promising areas include digitally designed retainers, objective monitoring of removable retainer wear and interventions aimed at improving adherence to retention protocols.

It would also be useful to develop core outcome sets for orthodontic retention studies. Standardized outcomes would make studies easier to compare and could improve the quality of future systematic reviews. In addition, long-term studies should evaluate not only tooth alignment but also retainer survival, periodontal effects, patient-reported outcomes and the economic burden of retention.

5. Conclusions

Retention is an integral phase of orthodontic treatment and should be considered during treatment planning. Orthodontic relapse is multifactorial and may result from periodontal tissue remodeling, soft tissue effects, residual growth, occlusal factors and natural age-related changes.

Current evidence does not support one retention method as universally superior for all patients. Fixed retainers provide continuous stabilization and reduce dependence on daily appliance wear, but they require good oral hygiene, regular monitoring and may fail over time. Removable retainers are easier to clean and inspect, but their effectiveness depends on regular use according to the prescribed protocol.

The duration of retention should be individualized. In some patients, long-term or indefinite retention may be justified, especially when relapse risk is high. Patient education, clear instructions and systematic follow-up are essential for maintaining treatment outcomes.

The most reasonable clinical approach is individualized retention planning. The choice of retainer should take into account the original malocclusion, treatment characteristics, relapse risk, periodontal status, oral hygiene, patient age, availability of follow-up care and expected adherence to recommendations.

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