COMPARING TRADITIONAL BRACES VS. MODERN ALTERNATIVES: A FOCUS ON ALIGNERS AND RETAINERS

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Abstract

Background:
Orthodontic treatment has traditionally relied on fixed appliances such as metal braces to correct dental malocclusions. However, recent advancements have introduced modern alternatives like clear aligners and advanced retainers, which promise better aesthetics, comfort, and patient compliance. This study aims to compare traditional braces with modern orthodontic options in terms of treatment efficiency, patient satisfaction, and clinical outcomes.

Materials and Methods:
A total of 90 patients aged 14–35 were enrolled in a 12-month prospective observational study. They were divided into three equal groups (n=30 each): Group A received traditional metal braces, Group B underwent treatment with clear aligners, and Group C used modern retainers post minor corrections. Parameters assessed included treatment duration, pain perception (VAS scale), oral hygiene status (Plaque Index), and patient satisfaction (Likert scale).

Results:
Group A showed an average treatment duration of 14.2 ± 1.1 months, Group B had 11.3 ± 0.9 months, while Group C had 6.5 ± 0.6 months. Pain scores were significantly higher in Group A (mean VAS: 7.1) compared to Group B (4.3) and Group C (2.1). Patient satisfaction was highest in Group B (Likert score: 4.8/5), followed by Group C (4.5/5) and Group A (3.2/5). Oral hygiene status remained more favorable in Groups B and C.

Conclusion:
Modern orthodontic alternatives like clear aligners and advanced retainers demonstrate improved patient comfort, reduced treatment time, and enhanced oral hygiene maintenance compared to traditional braces. While traditional braces remain effective for complex cases, clear aligners and retainers provide aesthetically pleasing and efficient options for suitable candidates.

Introduction

Orthodontic treatment aims to correct malocclusions, improve facial aesthetics, and enhance oral function. For decades, traditional fixed appliances such as metal braces have been the cornerstone of orthodontic therapy. These appliances apply continuous forces to reposition teeth over time and have demonstrated high clinical effectiveness in managing both simple and complex malocclusions (1). However, despite their effectiveness, conventional braces are often associated with discomfort, dietary restrictions, difficulty in maintaining oral hygiene, and esthetic concerns, especially among adolescents and adults (2,3).

In recent years, the advent of clear aligner systems and advanced removable retainers has revolutionized orthodontic practice. Clear aligners, most notably systems like Invisalign®, offer a series of removable, nearly invisible trays that gradually move teeth into alignment. These systems have gained popularity due to their aesthetic appeal, convenience, and ease of oral hygiene maintenance (4). Similarly, retainers, once used solely for post-treatment maintenance, have evolved to include active elements capable of performing minor tooth movements, providing a viable option for patients with mild malocclusions (5,6).

Numerous studies have highlighted the benefits of aligners over traditional braces, including reduced treatment discomfort, fewer emergency visits, and better periodontal health during treatment (7,8). However, fixed appliances remain the treatment of choice in cases requiring complex tooth movements or skeletal corrections (9). Given the increasing demand for esthetic and comfortable alternatives, it is important to compare these treatment modalities in a structured clinical setting.

This study aims to evaluate and compare the clinical efficiency, patient comfort, and satisfaction levels associated with traditional braces, clear aligners, and modern retainers, thus providing a comprehensive understanding of their relative merits in contemporary orthodontics.

Materials and Methods

Study Design and Participants

This prospective, comparative clinical study was conducted over a 12-month period at a private orthodontic practice. A total of 90 patients, aged between 14 and 35 years, seeking orthodontic treatment were enrolled after obtaining informed consent. Ethical approval was obtained from the institutional ethics committee prior to the commencement of the study.

Grouping and Treatment Modalities

Participants were randomly assigned into three groups (n = 30 per group) based on the treatment modality:

- **Group A**: Treated using conventional fixed metal braces (0.022-inch slot MBT system).
- **Group B**: Treated with clear thermoplastic aligners (Invisalign® or equivalent).
- **Group C**: Received active removable retainers (Hawley-type or Essix-type) for minor tooth movement.

All treatments were performed by the same experienced orthodontist to minimize operator variability.

Inclusion Criteria

- Patients with Class I malocclusion or mild to moderate spacing/crowding.
- Good oral hygiene and periodontal health.
- No previous orthodontic treatment history.

Exclusion Criteria

- Severe skeletal discrepancies requiring orthognathic surgery.
- Systemic diseases or medications affecting bone metabolism.
- Poor compliance with removable appliances (for Groups B and C).

Assessment Parameters

The following clinical parameters were evaluated:

1. **Treatment Duration**: Measured in months from appliance placement to active treatment completion.
2. **Pain Perception**: Evaluated using a 10-point Visual Analog Scale (VAS) during the first week of treatment.
3. **Oral Hygiene**: Assessed using the Plaque Index (Silness and Löe) at baseline and at 3-month intervals.
4. **Patient Satisfaction**: Measured post-treatment using a 5-point Likert scale questionnaire covering aesthetics, comfort, and convenience.

Statistical Analysis

Data were entered and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD). One-way ANOVA followed by Tukey's post hoc test was used to compare intergroup differences. A p-value < 0.05 was considered statistically significant.

Results

A total of 90 patients completed the study, with 30 individuals in each group. The mean age across all groups was 22.6 ± 5.1 years, with a male-to-female ratio of 1:1.2. All participants adhered to the treatment protocols without major complications.

1. Treatment Duration

The average treatment duration varied significantly among the three groups. Group A (traditional braces) had the longest mean duration (14.2 ± 1.1 months), followed by Group B (aligners) with 11.3 ± 0.9 months, and Group C (retainers) with the shortest duration (6.5 ± 0.6 months). These differences were statistically significant ($p < 0.01$) (Table 1).

2. Pain Perception

Pain levels during the first week of treatment were assessed using the Visual Analog Scale (VAS). Group A reported the highest discomfort (mean VAS: 7.1 ± 1.2), compared to Group B (4.3 ± 0.9) and Group C (2.1 ± 0.7). Intergroup comparisons showed a significant difference in pain scores ($p < 0.001$) (Table 2).

3. Oral Hygiene Status

Plaque Index (PI) values were recorded at baseline and at three months. At the three-month evaluation, Group A had higher PI scores (1.8 ± 0.4), while Groups B and C maintained better oral hygiene with PI values of 1.2 ± 0.3 and 1.1 ± 0.2, respectively ($p < 0.05$) (Table 3).

4. Patient Satisfaction

Based on the 5-point Likert scale, Group B (aligners) achieved the highest satisfaction score (4.8 ± 0.3), followed closely by Group C (4.5 ± 0.4), and then Group A (3.2 ± 0.6). The difference among the groups was statistically significant ($p < 0.01$) (Table 4).

Tables

Table 1: Comparison of Treatment Duration Across Groups

Group	Treatment Modality	Mean Duration (months) ± SD
A	Traditional Braces	14.2 ± 1.1
B	Clear Aligners	11.3 ± 0.9
C	Modern Retainers	6.5 ± 0.6

Table 2: Pain Perception in the First Week (VAS Scale 0–10)

Group	Mean Pain Score ± SD
A	7.1 ± 1.2
B	4.3 ± 0.9
C	2.1 ± 0.7

Table 3: Plaque Index (PI) Scores at 3-Month Follow-Up

Group	Mean PI Score ± SD
A	1.8 ± 0.4
B	1.2 ± 0.3
C	1.1 ± 0.2

Table 4: Patient Satisfaction Based on 5-Point Likert Scale

Group	Mean Satisfaction Score ± SD
A	3.2 ± 0.6
B	4.8 ± 0.3
C	4.5 ± 0.4

Discussion

The current study aimed to compare traditional fixed orthodontic appliances with modern alternatives such as clear aligners and retainers in terms of treatment efficiency, patient comfort, oral hygiene, and overall satisfaction. The findings revealed that clear aligners and advanced retainers offered notable advantages over conventional braces in several aspects, supporting the shift in contemporary orthodontic practice towards more patient-friendly treatment options.

In terms of treatment duration, patients treated with clear aligners and retainers showed significantly shorter completion times compared to those treated with fixed appliances. These results are consistent with earlier reports indicating that clear aligner therapy can reduce treatment duration, particularly in cases with mild to moderate malocclusions (1,2). Moreover, the efficiency of aligners is attributed to their pre-programmed tooth movement and better patient compliance (3).

Pain perception was notably higher among patients using traditional braces, especially during the initial adjustment period. This aligns with previous studies that have reported greater discomfort and soft tissue irritation with fixed appliances due to metal brackets and archwire forces (4,5). On the contrary, clear aligners, being smoother and removable, are associated with less pain and fewer emergency visits (6,7).

The oral hygiene outcomes further reinforced the benefits of removable appliances. Patients in the aligner and retainer groups maintained significantly better plaque control, likely due to the ability to remove the devices during brushing and flossing. Several authors have emphasized the increased risk of gingival inflammation and plaque accumulation associated with fixed braces (8,9). Maintaining oral

hygiene is a challenge in orthodontics, and aligners may offer a preventive edge in reducing demineralization and periodontal issues (10,11).

Patient satisfaction was highest among those receiving clear aligner therapy, largely due to improved aesthetics, reduced discomfort, and lifestyle compatibility. This finding is supported by research indicating that appearance plays a crucial role in appliance preference, especially among adult and adolescent populations (12,13). Furthermore, modern retainers also achieved high satisfaction scores, particularly among patients requiring minor corrections and desiring discreet appliances (14).

Despite the clear advantages of aligners and retainers, fixed appliances remain indispensable for cases requiring complex tooth movement or skeletal correction. Their versatility and biomechanical strength make them the treatment of choice in such scenarios (15). Therefore, treatment selection should be guided by clinical indications, patient expectations, and orthodontic expertise.

The limitations of this study include a relatively small sample size and a limited follow-up duration. Future studies with larger cohorts and long-term evaluations are needed to assess relapse rates and treatment stability across modalities.

Conclusion

Clear aligners and modern retainers demonstrate significant advantages over traditional fixed braces in terms of treatment comfort, duration, oral hygiene, and patient satisfaction. While fixed appliances remain essential for complex cases, aligners and retainers offer effective, aesthetic, and patient-friendly alternatives for mild to moderate malocclusions.

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