Enhancing Interceptive Orthodontic Efficiency:

The Impact of AI-Powered Remote Monitoring on RME and Motion Appliance Treatments

By Dr. Mike Ragan

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Dr. Ragan is a passionate advocate for cutting-edge dental technology and personalized care. He is an international speaker and lecturer on topics such as bite correction, airway management, and sports dentistry. His professional affiliations include the American Dental Association, Texas Dental Association, and several orthodontic societies, with leadership roles in regional and national organizations.

Abstract

Background

Interceptive orthodontic interventions aim to manage emerging malocclusions during the growth stage, thereby reducing the complexity of subsequent treatment. These therapies necessitate close monitoring to track progress and avert over-correction and undesirable outcomes. AI-powered remote monitoring platforms, such as DentalMonitoring (DM), facilitate remote tracking, diminishing the need for frequent in-person appointments while sustaining effective treatment advancement through periodic evaluations.

Methods

This retrospective comparative cohort study aimed to evaluate the impact of DM on treatment efficiency in patients undergoing RME and motion appliance therapy. Predefined metrics, including appointment frequency, treatment duration, and emergencies, were extracted from clinical records. Patients were divided into DM and non-DM cohorts.

Results

For motion appliance patients, DM reduced treatment duration by **25.21%** (from 229.27 to 170.47 days) and lowered the average number of in-office check appointments from **2.93 to 0.6**. The average value per visit was **$1,215.25**, significantly higher than the industry average of **$261 per visit**, with a net chairtime cost saving of **$252.33 per treatment**.

Similarly, for RME patients, DM shortened treatment duration by **27.4%** (from 167.47 to 121.6 days) and reduced in-office check appointments from **2.47 to 0.36**. The average value per visit was **$1,645.76**, with an average net chairtime cost saving of **$205.26 per treatment**.

Conclusion

AI-powered remote monitoring significantly enhances the efficiency of interceptive orthodontic treatments by reducing in-office visits and treatment duration while maintaining quality care. DM offers a promising approach for interceptive orthodontics, optimizing patient and practitioner experiences.

Introduction

Early orthodontic treatment, commonly known as Phase 1 or interceptive orthodontics, is typically conducted during mixed dentition and aims to address developing malocclusions and reduce treatment complexity1. The American Association of Orthodontists advises that children have their initial consultation with an orthodontic expert as soon as a potential orthodontic issue is identified, but definitely by the time they are seven years old. The rationale for early intervention lies in leveraging ongoing growth for easier and more effective treatment, potentially minimizing future complications and surgical interventions2. According to the literature, it can significantly improve various components of the American Board of Orthodontics Discrepancy Index, with an overall 42% improvement observed across different Angle classifications1. These treatments can encompass a range of orthodontic devices; two of the most commonly prescribed are the rapid maxillary expanders (RME) and the motion appliances.

RME devices are prescribed to correct posterior crossbites, which are commonly observed in primary dentition with a reported occurrence rate ranging from 8% to 22%3,4. Another reason why phase 1 RME has gained

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Introduction (continued)

in popularity is impacted by the general shift in the U.S. toward non-extraction treatment5. The typical treatment with RME consists of turning the device daily or every other day for approximately two to four months to address transverse differences, followed by 9–12 months of stabilization, many times in conjunction with treatments like braces and motion appliances. Patients are asked to activate the appliance regularly. To avoid overactivation, incomplete, or reverse turns, and to evaluate expansion progress, patients are reevaluated frequently, often weekly, until it is determined that adequate expansion has been obtained. After this determination is obtained, the patient is instructed to terminate the activation of the appliance.

The Motion appliance has become more popular over the past decade as a versatile intermaxillary Class II corrector as it offers fewer negative comfort-related side effects than other appliances for Class II correction6. The clinical principle is to establish a Class I relationship before initiating the correction of the position and alignment of individual teeth with fixed appliances or clear aligner therapy7. This treatment involves the use of intermaxillary elastics that require full-time wear (22 hours) - therefore good patient compliance is required. Similarly to RME treatment, this treatment requires close monitoring to avoid overcorrection, undesirable side effects, and issues such as not wearing the elastics.

With both of these treatments, most of the visits to the orthodontist are superfluous check appointments that aim to evaluate whether the treatment objective has been achieved yet, i.e., posterior crossbite correction with the RME, and Class II correction with the Motion appliance. These appointments can be easily replaced with remote monitoring. DentalMonitoring (DM) is an AI-powered orthodontic remote monitoring solution that alerts us whenever these objectives are achieved (Figure 1) or in when an undesirable side effect occurs (Figure 2). This approach achieves three key objectives: first, early detection helps us identify and address clinical issues promptly, preventing complications and avoiding treatment delays; second, personalized and consistent communication enhances patient education and improves the overall experience; finally, the use of weekly scans ensures treatment stays on track while minimizing the need for frequent in-office visits.

This study aims to evaluate the impact of using DM on RME and Motion treatments' efficiency.

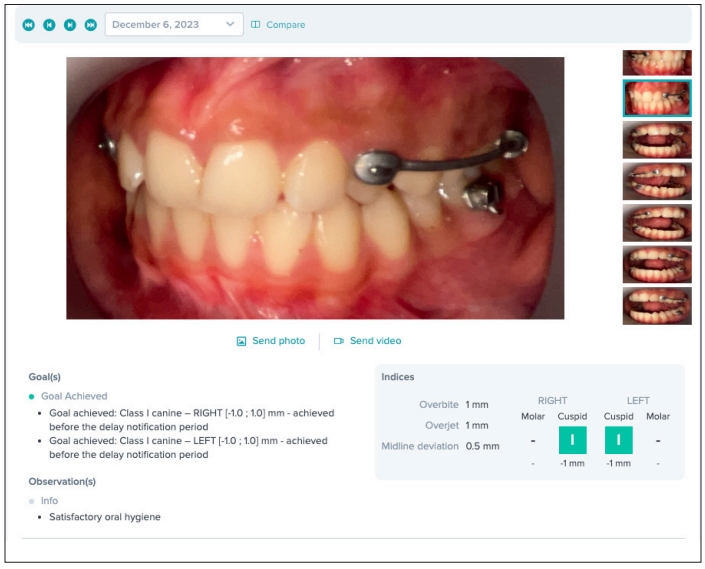

Fig. 1 - Class I Canine objective achieved with Motion treatment

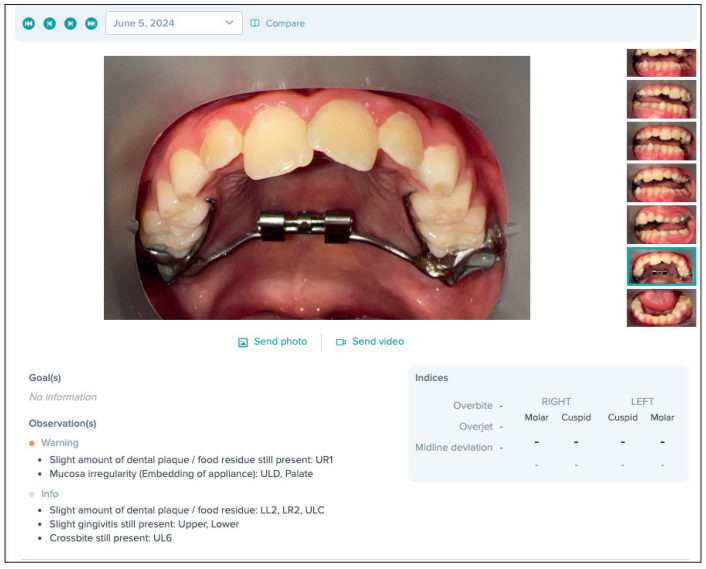

Fig. 2 - Hygiene issue and mucosa irregularity detected by the AI with an RPE treatment

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Materials & Methods

Study Design
This was a retrospective comparative cohort study in a private practice setting involving a single treating orthodontist.

The aim of this study was to assess the impact of DM on treatment efficiency with expanders and Carriere motion appliances. To achieve this objective, a set of treatment-related predefined metrics was extracted from the clinical notes of the Practice Management Software (PMS) and compared between the DM and non-DM cohorts.

Subjects Selection Criteria
The study focused on patients treated with expanders and Carriere motion. The patients were randomly selected.

For the DM cohorts, additional selection criteria were applied:

- Patients with inconsistent scanning or who stopped DM were excluded from the analysis for both treatment types.

The Data Extraction
Following the selection of study subjects to constitute the cohorts equitably, a PMS data extraction was performed for all the subjects to obtain the following parameters:

- Total number of appointments
- Adjustment/check appointments
- Emergency appointments
- Date of treatment start
- Date of treatment end

Results

Motion appliance cohorts
For the Motion patients, the initial cohorts encompassed 30 patients (15 DM and 15 non-DM). No exclusions were made.

The final results for the treatment efficiency metrics comparison are presented in the table below. The average value per visit is calculated using the following formula: Treatment fee / Number of visits. The motion treatment fee in my practice is $4460.

Patient Group	Total Number of Patients	Avg. Treatment Duration in Days	Avg. Total Number of Appointments	Av. Check Visits per Patient	Avg. Emergencies per Patient	Avg. Value per Visit
Control	15	229.27	6.73	2.93	0.87	$663.00
DM	15	170.47	3.67	0.60	1	$1215.25

Table I - Treatment efficiency and profitability metrics comparison for the Motion appliance patients

The table below explores the chair time cost saved with DM. According to Gaidge statistics, the average chairtime cost is $425/hour.8 The DM monthly cost without discount is $13/month.9 And lastly the average appointment duration is 15 minutes.

Avg. Treatment Duration in Months	Avg. DM Cost per Treatment	Av. Chair Time Saved per Treatment	Av. Chair Time Cost Saved per Treatment	Avg. Net Chair Time Cost Saved per Treatment
5.6	$72.80	45.9	$325.13	$252.33

Table II - Chair time cost saving with DM for the Motion appliance patients

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Results (continued)

Expander appliance cohorts
For the Motion patients, the initial cohorts encompassed 30 patients (15 DM and 15 non-DM). One DM subject was excluded from the study resulting in the final number of subjects being 29 (14 DM and 15 non-DM).

The final results for the treatment efficiency metrics comparison are presented in the table below. The average value per visit is calculated using the following formula: Treatment fee / Number of visits. The motion treatment fee in my practice is $4460.

Patient Group	Total Number of Patients	Avg. Treatment Duration in Days	Avg. Total Number of Appointments	Av. Check Visits per Patient	Avg. Emergencies per Patient	Avg. Value per Visit
Control	15	167.47	5.13	2.47	0.6	$869.40
DM	14	121.6	2.71	0.36	0.43	$1645.76

Table III - Treatment efficiency and profitability metrics comparison for the expander appliance patients

The table below explores the chair time cost saved with DM.

Avg. Treatment Duration in Months	Avg. DM Cost per Treatment	Av. Chair Time Saved per Treatment	Av. Chair Time Cost Saved per Treatment	Avg. Net Chair Time Cost Saved per Treatment
3.99	$51.87	36.3	$257.13	$205.26

Table IV - Chair time cost saving with DM for the expander appliance patients

Discussion

This retrospective study aimed to evaluate the impact of DM on RME and motion treatment efficiency by comparing a set of predefined metrics.

The results reveal a clear pattern: patients monitored with DM demonstrated significant improvements across all efficiency metrics. For patients treated with motion appliances, the DM group experienced a 45% reduction in the average total number of appointments. This reduction came primarily from decreasing the number of unnecessary check appointments as they could now be replaced with remote monitoring oversight. With the DM group, the average number of check appointments went from almost 3 per patient to 0.6. This indicates that with most patients undergoing motion treatment with DM, no in-office visits were required. Additionally, we observed a significant decrease (25.21%) in treatment time. That could suggest enhanced patient compliance especially with wearing the intermaxillary elastics or addressing no wear ahead of slowing treatment down. With emergencies, the difference was clinically insignificant. In terms of profitability, The value per visit was $1215,25 which significant higher than industry average which is $261 per visit according to the Gaidge 2023 report.10 The average chair time cost saving per treatment with DM was $252.33.

For the RME patients, the DM group had 2.42 fewer total appointments than the control group, corresponding to a 47% decrease. That decrease came mostly from eliminating unnecessary in-office appointments which went down from 2.47 with the control group to 0.36 with the DM group. Similar to what was observed in the motion group, patients undergoing RME treatment and monitored with DM can replace their in-person visits with monitoring, a finding consistent with a previously published study in 2019.11 The average value per visit was $1645,76 and net chairtime cost saving was $205.26.

The findings of this study underscore the increased efficiency achieved through weekly oversight with

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Discussion (continued)

DM, enabling practitioners to maintain precise control over treatment. This proactive approach helps prevent unwanted corrections, improper appliance use, and lessen potential issues that could disrupt the treatment process.

As AI-powered remote monitoring becomes the prevailing standard of care in interceptive orthodontics, future research endeavors should further explore the ramifications of this innovative approach on patient care quality, experience, and treatment efficiency with various types of appliances.

Conclusion

The main findings of this study indicate that DM can significantly improve the efficiency of both RME and motion appliances' interceptive orthodontic treatments. For both treatments, DM resulted in a significant reduction in the total number of visits by replacing most In-person evaluations with remote monitoring.

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