

Comparison of the Effectiveness of Edgewise Braces and Aligners in terms of Time Efficiency

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ABSTRACT

Aim: To compare the effectiveness of edgewise braces and aligners in terms of time efficiency.

Methods and materials: The retrospective portion examined the medical records of 300 patients who received CEB and 300 patients who received ALT treatments. The appointments for CEB patients were categorized as normal, emergency, initial banding and bonding, or ultimate debanding. Since they are the equivalent for both CEB and ALT patients, documentation visits, discussions, and retainer appointment scheduling were excluded from the analysis. The length of chair as well as doctor duration for every one of the 4 categories of appointments was determined by the prospective portion of the study.

Results: 266 ALT visits and 254 CEB sessions in total were monitored. Initial visits had the longest median chair times, followed by final, regular, and emergency appointments, in that order. Doctor time made up between 4 percentage and 41percent of chair time. The chair times for routine and final appointments were noticeably ($P=0.05$) lengthier for CEB than ALT. The initial appointment with the doctor took much longer for CEB. On the other hand, ALT took much longer for regular and final doctor visits.

Conclusion: The effectiveness and efficiency of using ALT in practise depends on how well patients follow their prescribed course of action. It was found that whether the improved time effectiveness of ALT compensates the higher material costs and doctor time required depends on the orthodontist's experience and the frequency of ALT case began.

Keywords: Clear Aligners, Edgewise braces, Time efficiency

INTRODUCTION

For orthodontists in private practise, proper time execution is a crucial outcome indicator since it frequently impacts the choice of treatment approach. For instance, it has been demonstrated that self-ligating brackets are more

effective than traditional edgewise brackets in regards to overall chair time and treatment time.^[1-4] Base treatment effectiveness for the orthodontist on overall doctor minutes, overall chair minute, and material expenditures. A novel kind of therapy, consisting of a set of computer-generated, transparent, and removable aligners, was introduced by Align Technology in 1999.^[5] Patients who choose to receive clear aligner treatment (ALT) have revealed that aesthetics is their top priority.^[6]

The option to withdraw the aligners while eating, improved brushing and flossing capabilities, and a treatment without the use of metal that might hurt the cheek and lips are further advantages.^[7] The overall number of appointments necessary for ALT cases, the proportion of patients needing midcourse modifications, and the quantity of patients needing fixed appliances all rely on how complex the treatments are before treatment.^[8] It is currently unknown how ALT compares to the standard edgewise braces (CEB) technique in terms of therapeutic effectiveness.^[9] The current study was created to assess ALT and CEB using patients seen by a single, highly skilled orthodontist who had the identical goals for every patient..

By guaranteeing that the study participants began therapy with equal degrees of complexity and by assessing the real expenses in terms of both the materials utilized and the hours invested during the different stages of each treatment, the research goes beyond earlier assessments of efficiency.

MATERIALS AND METHODS

The retrospective portion examined the medical records of 300 patients who received CEB and 300 patients who received ALT treatments. One orthodontist's clinic provided all of the records (DC). Patients who met the following selection criteria—pretreatment Class I molar and canine relationships, non-extraction therapies, and mandibular crowding of 5 mm or less—were consecutively treated patients, commencing with the most recent treatment performed. Any patient records with anterior or posterior crossbites, anterior or lateral open bites, or overjets longer than 4 mm were rejected. Patients with ALT who had braces were disqualified from the research. Based on mandibular crowding and the number of rotated teeth, the retrospective ALT sample was first identified, and the CEB sample was then matched to the ALT sample. The Alexander Discipline prescription was used on the CEB sample; the archwire sequence was 0.016-inch nickel-titanium, 0.016-inch stainless steel, and finally 0.016 x 0.022-inch stainless steel.

Patient Record Analysis

Age, sex, mandibular crowding, the number of teeth rotated more than 45 degrees or displaced more than 2 millimetres, the total treatment time, the total number of appointments, and the types of appointments were all evaluated in each patient's file. Based on the data supplied in the patient records, the types and quantity of items utilized were also evaluated. Despite the fact that the lab charge can change depending on how many patients the orthodontist treats, the ALT lab fee used in the current study was \$1549. Each impression for ALT patients cost the orthodontist \$20.75, which also covers the price of Blu-Mouse and Penta Putty, a fast-setting impression material from 3M, St. Paul, Minnesota (Parkell, Edgewood, NY). At the introductory ALT appointment, each individual

receives one impression; if the patient needed a midcourse adjustment, they received a second impression at no additional expense.

The cost of the materials for the patients using conventional braces was estimated based on the quantity and types of wires utilised, the number of brackets employed, the bonding substance, the primer, the flame tip bur, and the after-care package. A visible scale of the mandible occlusal photos was used to evaluate the degree of congestion in the mandibular arch. Based on the degree of crowding, 9 patients were divided into 5 categories: category 1 = 0-1 mm, category 2 = 1-2 mm, category 3 = 2-3 mm, category 4 = 3-4 mm, and category 5 = 4-5 mm.

Twenty mandibular occlusal pictures were randomly chosen, evaluated, and then reevaluated 24 hours later to ascertain the intraexaminer reliability of the mandibular crowding. Crowding and rotation both have a Cronbach alpha of 0.97 and 1.00, respectively.

The number of appointments for each patient was counted after two investigators went over each patient's file. There were four different kinds of appointments for both groups. A first impression appointment, routine appointments such as aligner delivery and midcourse adjustments, emergency appointments, and final ALT appointments were all assigned to the ALT patients. The appointments for CEB patients were categorised as normal, emergency, initial banding and bonding, or ultimate debanding. Since they are the equivalent for both CEB and ALT patients, documentation visits, discussions, and retainer appointment scheduling were excluded from the analysis.

Timing

The length of chair as well as doctor duration for every one of the 4 categories of appointments was determined by the prospective portion of the study. A stopwatch was used to time each successive patient entering the office, and each appointment's duration was rounded to the closest 15 seconds. The participant's total chair time started when they sat down and lasted when they got up to leave. Doctor time comprised all the time the doctor worked with the client, whether they were conversing or receiving medical attention. In order to compare the groups, Mann-Whitney U-tests were used to compare the times obtained during the prospective stage of the study because they were not regularly distributed.

RESULTS

Prospective Phase

266 ALT visits and 254 CEB sessions in total were monitored (Table 1). Initial visits had the longest median chair times, followed by final, regular, and emergency appointments, in that order. Doctor time made up between 4 percentage and 41 percent of chair time. The chair times for routine and final appointments were noticeably ($P=0.05$) lengthier for CEB than ALT. The initial appointment with the doctor took much longer for CEB. On the other hand, ALT took much longer for regular and final doctor visits.

Table 1: Total chair time and doctor time for the four types of appointments in clear aligner therapy.

	N	Chair		Doctor	
		Median	IQR	Median	IDR
Initial	40	24.6	8.1	2	3
Routine	108	10.7	11	4	5.4
Emergency	10	7.6	7.1	3.4	7
Final	104	10.7	11	4	5.4

Retrospective Phase

Sixty-six percent of the subjects in the ALT category were female, compared to 52 percent in the CEB group, a difference that was statistically significant ($P = .019$). The 350 patients who received ALT therapy were substantially older than those who received CEB therapy (Table 2). Here between ALT versus CEB groups, there weren't any statistically meaningful ($P = 0.05$) changes in the initial crowding or the quantity of rotated as well as displaced teeth. CEB required considerably ($P = 0.001$) more sessions and 5.6 months of treatment time compared to ALT. Additionally, CEB required considerably longer chair duration (94.5 minutes) versus ALT, involving lengthier final sessions (18.9 minutes), lengthier emergency visits (8 minutes), and lengthier routine sessions (75.5 minutes). Contrarily, ALT demanded much more medical attention from a doctor than CEB, necessitating longer regular, emergency, and final visits. Compared to ALT, CEB needed more initial visits. Compared to conventional braces, ALT has substantially higher total expenses. (Table 3)

Table 2: Total chair time and doctor time for the four types of appointments in conventional Edgewise Braces

	N	Chair		Doctor	
		Median	IQR	Median	IDR
Initial	54	30.6	19.4	3.4	1.86
Routine	120	14.7	12.7	3.1	3.1
Emergency	40	10.2	11.1	0.6	2
Final	40	28.5	11.6	4.2	2.4

Table 3: Differences in chair side time and doctor time in clear aligner group and conventional edgewise braces

	Chair side time	Doctor time
	p value	p value
Initial	0.058	0.001
Routine	0.005	0.001
Emergency	0.946	0.212
Final	0.001	0.013

DISCUSSION AND CONCLUSION

Additional benefits include the flexibility to remove the aligners when eating, enhanced brushing and flossing capabilities, and a procedure without the use of metal that could harm the cheeks and lips.^[10] Depending on how complex the treatments are before treatment, the total number of appointments required for ALT cases, the percentage of patients needing midcourse adjustments, and the number of patients needing fixed appliances can all vary. The treatment efficacy of ALT in comparison to the conventional edgewise braces (CEB) approach is yet uncertain. Using patients visited by a single, highly trained orthodontist who had the same objectives for every patient, the current study was designed to evaluate ALT and CEB.^[11-12]

The research goes beyond past evaluations of efficiency by ensuring that the study participants began therapy with comparable degrees of complexity and by analysing the real costs in terms of both the materials used and the hours invested during the different stages of each treatment.

The median chair time in this study was the longest for initial visits, then final, regular, and emergency appointments, in that order. Between 4% and 41% of chair time was spent with doctors. For routine and final sessions, CEB's chair times were noticeably ($P=0.05$) longer than ALT's. For CEB, the initial visit to the doctor took a lot longer. However, ALT took a lot longer for follow-up and final doctor visits.

Proper time management is a critical outcome indicator for orthodontists in private practise since it frequently influences the selection of treatment strategy. For instance, it has been proven that self-ligating brackets reduce treatment time and chair time more efficiently than conventional edgewise brackets.¹⁰⁻¹¹ Calculate the effectiveness of the orthodontist's treatment based on the total number of chair minutes, total doctor minutes, and material costs. In 1999, Align Technology unveiled an unique form of treatment that included a series of computer-generated, transparent, and removeable aligners. 5 Aesthetics are the main concern of patients who elect to have clear aligner treatment (ALT).^[12-13]

Each patient's file had evaluations of age, sex, mandibular crowding, the number of teeth rotated more than 45 degrees or displaced more than 2 millimetres, the total treatment time, the total number of appointments, and the types of treatments. The types and quantities of the goods used were also assessed based on the information provided in the patient records. Each person got one impression during the initial ALT appointment; if the patient required a midcourse adjustment, they received a second impression at no additional cost.

Based on the quantity and types of wires used, the number of brackets used, the bonding agent, the primer, the flame tip bur, and the after-care package, the cost of the materials for the patients wearing conventional braces was approximated.

Age, sex, mandibular crowding, the number of teeth rotated more than 45 degrees or displaced more than 2 millimetres, the overall treatment time, the overall number of sessions, and the types of treatments were all evaluated for each patient. Based on the data supplied in the medical records, the types and quantities of the commodities consumed were also evaluated. During the initial ALT appointment, each person received one impression; if the patient needed a midcourse adjustment, they received a second impression at no additional expense. The approximate cost of the materials for the patients using conventional braces was determined by

looking at the quantity and types of wires used, the number of brackets used, the bonding agent, the primer, the flame tip bur, and the after-care package.

For both groups, there were four different types of appointments. The ALT patients were given appointments for a first impression, normal appointments like aligner delivery and midcourse modifications, emergency appointments, and final ALT appointments. Patients with CEB had appointments that were divided into normal, emergency, initial banding and bonding, and ultimate debanding categories. The analysis did not include documentation visits, conversations, or scheduling of retainer appointments because they are equivalent for both CEB and ALT patients.

In our study, 66% of respondents in the ALT category and 52% of subjects in the CEB group were female; this difference was statistically significant ($P = .019$). In comparison to the 350 patients who received CEB therapy, the 350 patients who received ALT therapy were much older. In this case, there were no statistically significant ($P=0.05$) differences in the initial crowding or the number of rotated and displaced teeth between the ALT and CEB groups. In comparison to ALT, CEB required significantly ($P=0.001$) more sessions and 5.6 months of treatment. Additionally, compared to ALT, CEB needed a chair duration that was significantly longer (94.5 minutes), with longer final sessions (18.9 minutes), longer emergency visits (8 minutes), and longer routine sessions (75.5 minutes). Contrarily, ALT required longer routine, emergency, and final visits because it required a lot more medical care from a doctor than CEB. CEB required more first visits than ALT did. The overall cost of ALT is much more than that of traditional braces.

Based on the dynamics of the practise, which affect effectiveness in a practise scenario, the precise numbers will vary greatly. In spite of using ALT, an orthodontist with very effective assistants would still be very profitable because CEB has substantially lower material costs than ALT.¹⁵ Planning, patient management, and a host of other factors all affect efficiency. If the increased time effectiveness of ALT balances the higher costs for required materials, it will ultimately depend on the expertise of the orthodontist specialists and the number of ALT case starts.^[17-18]

Patient cooperation is crucial for the effective and correct treatment of ALT patients. The patient is ultimately responsible for deciding whether or not to wear the aligners.^[14-16] With brackets, the orthodontist can more correctly predict outcomes, treat malocclusions, and better control movement. The effectiveness and efficiency of using ALT in practise depends on how well patients follow their prescribed course of action. It was found that whether the improved time effectiveness of ALT compensates the higher material costs and doctor time required depends on the orthodontist's experience and the frequency of ALT case began.

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