

MANAGEMENT & MARKETING

(Editor's Note: This quarterly JCO column is compiled by Contributing Editor Robert Haeger. Every three months, Dr. Haeger presents a successful approach or strategy for a particular aspect of practice management. Your suggestions for future topics or authors are welcome.)

Whenever two or more orthodontists are in the same room, Phase I treatment is bound to be discussed. This Management & Marketing column compares two-phase orthodontic treatment with full single-stage treatment, continuing our focus on statistical analysis and its ability to improve the efficiency of clinical orthodontic practice. With the help of Dr. Roger Colberg, a professor of statistics and marketing specializing in product development, I have analyzed various parameters of these two treatment approaches and the financial implications for different groups of patients.

Because my office converted to fully electronic record-keeping in 2001, I now have sufficient statistical data to study this issue objectively. Having conducted a thorough statistical practice analysis three years ago, I can evaluate the effectiveness of the initial examination appointment, the treatment coordinators, our recall system, and different appointment intervals, as well as the time needed to treat all kinds of malocclusions with various techniques and appliances. As a result of this analysis, my patients' average treatment time has decreased by four to six months.

Last year, I presented data regarding the effects of missed appointments and bracket failures (JCO, August 2007). The information presented this month exemplifies another of the many ways I can now quantify and analyze the treatment provided by my office. Statistical analysis has given me a better understanding of my patients and has allowed me to increase the efficiency of treatment, while providing valuable insights for prospective patients at their initial appointments.

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Statistical Analysis of Two-Phase Treatment Compared with Single-Stage Comprehensive Treatment

This article reports the results of a comparative study of the efficiency of two-phase orthodontic treatment vs. single-stage comprehensive treatment. Statistical analysis was conducted on 60 consecutively debonded Phase I and II patients and 394 similar full-treatment patients in my office. The two approaches were evaluated and compared in terms of the number of appointments required, the number of months the patient spent in orthodontic appliances, the required clinician and assistant time, and revenue generated for the office in dollars per appointment and per clinician minute.

The initial sample consisted of 946 consec-



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utive patients concluding treatment in my practice, for whom numerous variables were recorded after debonding. Sixty of these patients completed two phases of treatment. The significant parameters were defined as follows.

Phase I treatment: Treatment involving active tooth movement with some form of fixed appliance, such as an upper 2 × 4, expander, or headgear. Use of a lower lingual holding arch was not considered Phase I treatment.

Number of active appointments: The number of appointments required to complete treatment, including bonding, debonding, and all active visits in between. Not included were retainer-delivery appointments, retention visits (eruption checks) between phases, and emergency visits at which nothing was done to progress toward completion of treatment. If a bracket was recemented during the emergency visit, a new chain was added, or anything extra was done, it was counted as an active appointment.

Treatment time: The number of months required to complete treatment, including appliance placement and debonding.

Molar classification: Class I, 100% Class II, 50% Class II, or Class III (see my previous article, JCO, August 2007).

Methodology

Excluded from the analysis were all patients with extractions, missing permanent teeth, or impactions, as well as transfers, surgical cases, and a few extreme outliers. This reduced the sample size to 60 two-phase and 394 full-treatment patients. Three different assistants recorded the results. Several discussions and reviews of the data took place along the way to standardize the methodology.

The treatment for all patients involved Bidimensional* vertical-slot brackets with bands on the upper first molars and brackets on the lower first molars and all second molars. All brackets were bonded directly with Reliance Light Bond* adhesive.

*American Orthodontics, Inc., 1714 Cambridge Ave., Sheboygan, WI 53082; www.americanortho.com.

**Reliance Orthodontic Products, Inc., P.O. Box 678, Itasca, IL 60143; www.relianceorthodontics.com.

Results

The 60 two-phase patients averaged 1.3 visits before diagnostic records were taken and began treatment at an average age of 8.4 years (Table 1). (If records were obtained at the first appointment, the patient was considered to have zero pre-records visits.) These two-phase patients had an average of 4.0 visits after the conclusion of active Phase I treatment (including the retainer-delivery appointment) before records were obtained for the second stage, which began at an average age of 11.8 years. The full-treatment patients were seen an average of 1.6 times before diagnostic records were taken; their average age at the start of orthodontic treatment was 12.0 years.

The patients who underwent two phases of treatment were in fixed appliances for an average of 7.7 months longer than the full-treatment patients (Table 2). In addition, they required an average of 8.9 (58.2%) more active appointments, 52.1 (51.3%) more clinician minutes, and 182.7 (51.5%) more assistant minutes to treat. The full-treatment patients averaged only 3.1 more months in fixed appliances, 2.1 more active appointments, 9.4 more clinician minutes, and 33.1 more assistant minutes than were required for Phase II treatment alone.

Similar results were found when the sample was subdivided by molar classification (Tables 3-5). Of the two-phase patients, 31 had Class I relationships, 25 had Class II relationships, and only four had Class III relationships. Patients were kept in their Phase I molar classification groups even if their molar relationships changed before starting Phase II therapy.

**TABLE 1
CHARACTERISTICS OF
PATIENT SAMPLE**

	Phase I	Phase II	Full Treatment
Number of patients	60	60	394
Starting age (years)	8.4	11.8	12.0
Pre-records appointments (number)	1.3	4.0	1.6

**TABLE 2
MEAN RESULTS FOR ENTIRE SAMPLE**

	Phase I	Phase II	Combined Phase I/II	Full Treatment*
Treatment time (months)	10.8	17.1	27.9	20.2
Active appointments (number)	11.0	13.2	24.2	15.3
Clinician time (minutes)	61.5	92.1	153.6	101.5
Assistant time (minutes)	215.8	321.7	537.5	354.8

*All differences between the Combined Phase I/II and Full Treatment groups are statistically significant at or below the .01 probability level.

**TABLE 3
MEAN RESULTS FOR CLASS I PATIENTS**

	Phase I	Phase II	Combined Phase I/II	Full Treatment*
Sample size	31	31	31	203
Treatment time (months)	10.0	16.3	26.3	18.5
Active appointments (number)	10.6	12.5	23.1	13.9
Clinician time (minutes)	59.6	90.0	149.6	94.7
Assistant time (minutes)	212.9	314.0	526.9	331.0

*All differences between the Combined Phase I/II and Full Treatment groups are statistically significant at or below the .01 probability level.

**TABLE 4
MEAN RESULTS FOR CLASS II PATIENTS**

	Phase I	Phase II	Combined Phase I/II	Full Treatment*
Sample size	25	25	25	180
Treatment time (months)	11.9	18.2	30.1	22.1
Active appointments (number)	11.7	14.0	25.7	16.8
Clinician time (minutes)	64.3	94.9	159.2	108.9
Assistant time (minutes)	223.0	334.0	557.0	379.7

*All differences between the Combined Phase I/II and Full Treatment groups are statistically significant at or below the .01 probability level.

**TABLE 5
MEAN RESULTS FOR CLASS III PATIENTS**

	Phase I	Phase II	Combined Phase I/II	Full Treatment	p*
Sample size	4	4	4	11	
Treatment time (months)	10.3	16.0	26.3	22.5	.132
Active appointments (number)	10.3	13.5	23.8	17.2	.015
Clinician time (minutes)	59.3	90.3	149.6	106.1	.002
Assistant time (minutes)	193.3	304.8	498.1	384.6	.002

*Statistical significance of differences between the Combined Phase I/II and Full Treatment groups. The "p" values are higher than for Class I and Class II patients because of the small size of the Class III samples.

**TABLE 6
FINANCIAL DIFFERENTIALS FOR ENTIRE SAMPLE**

	Full Treatment	Combined Phase I/II	Difference*
Fee	X	X + \$1,251.59	+23.9%
Revenue per appointment	Y	Y - \$84.40	-23.1%
Revenue per clinician minute	Z	Z - \$10.97	-20.3%

*All differences are statistically significant at or below the .01 probability level.

**TABLE 7
FINANCIAL DIFFERENTIALS FOR CLASS I PATIENTS**

	Full Treatment	Combined Phase I/II	Difference*
Fee	X	X + \$1,275.07	+24.8%
Revenue per appointment	Y	Y - \$100.46	-25.7%
Revenue per clinician minute	Z	Z - \$13.22	-23.2%

*All differences are statistically significant at or below the .01 probability level.

**TABLE 8
FINANCIAL DIFFERENTIALS FOR CLASS II PATIENTS**

	Full Treatment	Combined Phase I/II	Difference*
Fee	X	X + \$1,234.67	+23.1%
Revenue per appointment	Y	Y - \$70.95	-21.0%
Revenue per clinician minute	Z	Z - \$9.01	-17.8%

*All differences are statistically significant at or below the .01 probability level.

**TABLE 9
FINANCIAL DIFFERENTIALS FOR CLASS III PATIENTS**

	Full Treatment	Combined Phase I/II	Difference	p*
Fee	X	X + \$1,202.57	+22.3%	.000
Revenue per appointment	Y	Y - \$35.51	-11.0%	.196
Revenue per clinician minute	Z	Z - \$6.06	-11.9%	.116

*Values are generally higher than for Class I and Class II patients because of the small size of the Class III samples.

**TABLE 10
ADDITIONAL FEE NEEDED FOR TWO-PHASE TREATMENT
TO EQUAL PRODUCTIVITY OF COMPREHENSIVE TREATMENT**

	Entire Sample	Class I	Class II	Class III
For same revenue per appointment	\$3,547	\$3,883	\$3,229	\$2,343
For same revenue per clinician minute	\$3,051	\$3,386	\$2,734	\$2,301

The patients who underwent two-phase treatment paid an average of \$1,251.59 (23.9%) more than the full-treatment patients (Table 6). Despite the additional fees, however, the revenue generated per appointment and revenue generated per clinician minute were 23.1% and 20.3% less, respectively, than for the full-treatment patients. Tables 7 through 9 show the corresponding results for the different molar classifications.

Multiplying the full-treatment revenue per appointment by the combined number of appointments in Phases I and II yielded the full cost of two-phase treatment. The difference between this cost and the smaller full-treatment fee was the additional fee required for two-phase treatment to be as productive as full treatment (Table 10). The same calculations were performed for revenue per clinician minute.

Discussion

In my office, as demonstrated in this study, two-phase orthodontic treatment was not as efficient as single-stage comprehensive treatment. Two-phase treatment required about eight more months of active treatment than full treatment, not including the time spent wearing retainers between phases (Tables 2-5). This additional time in fixed appliances demanded almost nine more active visits and four retainer checks between phases, for a total of 13 more visits than full treatment—an increase of nearly 100%.

The extra appointments must be evaluated from the parents' perspective as well as that of the practice. For a parent, each appointment demands far more than the 15-30 minutes spent in our office. The time needed to leave work, pick up the child at school, come to the office, take the child back to school, and return to work takes two to four hours out of the day. Parents are much happier when the same results can be achieved with less time and effort on their part.

The fee for two-phase treatment was 22-25% higher than that for full treatment, depending on the molar classification. Although one might expect the orthodontic practice to benefit from higher fees, the opposite was true: Because two-

phase treatment required more appointments than full treatment, the revenue per appointment and revenue per clinician minute were at least 20% less. To achieve the same revenue for two-phase treatment as for full treatment, I would have had to charge at least \$3,000 more than the full-treatment fee. This is a sizable difference, and one that most families would not agree to if they were well informed.

The economic differential for Class III cases was smaller than for other molar classifications, with two-phase treatment producing 11-12% less revenue per appointment or clinician minute. In this sample, at least, two-phase treatment seemed more efficient in Class III patients than in Class I or II cases.

There are certain patients on the two-phase treatment track who end up not needing Phase II treatment, and who would have undergone more extensive and expensive treatment if they had waited to pursue full treatment in a single stage. For every one of these patients, however, there are many more who transfer during the course of two-phase treatment and end up in full treatment at different offices. These patients receive no benefit from their Phase I treatment, and their expenses turn out to be far greater. In addition, some patients elect not to proceed with Phase II treatment, accepting an inferior result. If they had spent the same amount of time in full treatment, their results would have been much better.

Now that I am armed with the results of this statistical analysis, my presentations of treatment options have become much simpler. We often discuss the differences between two-phase treatment and waiting to pursue full treatment in the future. The children tend to want immediate treatment, but the parents, who greatly appreciate a straightforward presentation of the time, benefits, and cost differential associated with two-phase therapy, usually choose to wait for full treatment.

The inefficiency of two-phase orthodontic treatment has led me to adopt the following criteria for recommending Phase I treatment.

Anterior crossbite: The goal of Phase I treatment is to prevent labial gingival recession of the lower incisors. The exception is when a mandib-

ular lateral incisor is in crossbite with the maxillary lateral, but not the maxillary central incisor; in such a case, we often wait for full treatment, because there is no risk of gingival recession.

Unilateral posterior crossbite with a mandibular shift: The goal of Phase I is to prevent asymmetrical mandibular growth.

Significant anterior open bite: The goal of Phase I is to limit lisping and maintain the ability to cut food with the incisors.

Early loss of primary teeth: The goal is to maintain space for the developing permanent teeth and prevent mesial drifting of the molars over the premolars.

Thumbsucking: The goal is to prevent social hardship, as well as excessive proclination of the upper incisors.

Extremely crooked teeth causing self-consciousness: The goal is to improve esthetics while waiting for more of the permanent teeth to devel-

op. These children often have major esthetic concerns and late-developing premolars. For them, it is worth spending additional time and money in orthodontic treatment to avoid problems with self-esteem and confidence.

Conclusion

An excellent treatment result is always the primary goal of orthodontic treatment, but is not sufficient in itself. We must also aim to increase the efficiency and productivity of our specialty by minimizing treatment time, orthodontic adjustments, and unnecessary appointments. Two-phase treatment, indirect bonding, the use of self-ligating brackets, and various other orthodontic techniques should be continually monitored to determine their value. I recommend using a similar statistical analysis in your own practice to confirm or refute the findings presented here. □