

Comparative Use of Invisalign® by Orthodontists and General Practitioners

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ABSTRACT

Objective: To test the hypothesis that there is no difference in the use of Invisalign® between orthodontists and general practitioners.

Materials and Methods: A questionnaire was mailed to all Invisalign® providers within a 35-mile radius of Stony Brook University. The answers were statistically analyzed. The level of significance was set at $P < .05$.

Results: Orthodontists started more Invisalign® cases ($P < .0001$). General practitioners started more Invisalign® cases in the last 12 months ($P = .0012$). For both groups, the percentage of cases started in the last 12 months was inversely related to the number of years certified in Invisalign® ($P < .0001$). Significant differences in opinion ($P < .001$) were noted between orthodontists and general practitioners regarding the level of experience necessary to treat a Class I malocclusion with a large diastema, and whether a Class II subdivision case should be treated with Invisalign®.

Conclusion: The hypothesis is rejected. The use of Invisalign® by orthodontists and general practitioners was compared, and significant differences were found. (*Angle Orthod.* 2010;80:425–434.)

KEY WORDS: Invisalign®; General practitioners

INTRODUCTION

General practitioners graduate from dental school with limited training in orthodontic diagnosis and treatment.^{1,2} Later, some pursue additional orthodontic knowledge through continuing education courses. Whether general practitioners have enough training to provide comprehensive orthodontic treatment is controversial.³

Several studies have been conducted to determine the number of general practitioners who provide orthodontic care. Koroluk et al⁴ found that of 500 general practitioners surveyed in Indiana, 17.9% provided comprehensive orthodontic treatment. A study by Wolsky and McNamara⁵ found that 19.3% of the general dentists surveyed in Michigan provided comprehensive orthodontic treatment. In 2006, Gal-

breath et al⁶ concluded from their study that the percentage of general practitioners who provided comprehensive orthodontic treatment with fixed or removable appliances, including Invisalign®, remained unchanged from previous studies.

Invisalign® was developed by Align Technology Inc (Santa Clara, Calif) in 1997. It was originally marketed to orthodontists only. However, after settling a class action lawsuit by a group of general dentists, Align began offering its services to general practitioners as well.⁷ Through extensive marketing, Invisalign® has become a treatment modality that most orthodontists and general practitioners are now familiar with, a decade after its development.

Because of differences in the educational background of general practitioners and orthodontists, it would be interesting to see how their experiences with Invisalign® compare. It would also be intriguing to see if general practitioners are using Invisalign® to treat the same types of malocclusions as orthodontists. The purpose of this study is to compare the use of Invisalign® between orthodontists and general practitioners.

MATERIALS AND METHODS

This study was performed using a 25-question survey. The questionnaire was approved for use by the Stony Brook University Committee on Research

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Table 1. Years in Practice and Years Certified in Invisalign®^a

		Mean	P Value of Rank Test
Years in practice	Ortho	20.3	.32
	GP	18.5	
Years certified in Invisalign	Ortho	5.8	<.0001
	GP	3.4	

^a GP indicates general practitioner; Ortho, orthodontist.

Involving Human Subjects. Using the Invisalign® provider database,⁸ a questionnaire with a cover letter and a self-addressed stamped envelope was mailed to all Invisalign® providers within a 35-mile radius of Stony Brook University. A total of 406 questionnaires were mailed: 284 to general practitioners and 122 to orthodontists.

The questionnaire was divided into four sections: background information, Invisalign® experience, initial certification, and case selection. Responses to questions in the first two sections consisted of filling in the blank, yes or no, and multiple choices. In the third section, participants were asked to respond by selecting from five choices: strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree. In the last section, participants were given a series of intraoral photos of six different malocclusions. Each series consisted of a frontal, right, left, and maxillary and mandibular occlusal picture; no other information was provided. Participants were asked whether they would use Invisalign® to treat these cases, and if so, how much experience they felt was necessary before they were treated. The choices of responses were first case, second to fifteenth case, sixteenth to fiftieth case, greater than fiftieth case, never treat this case Invisalign®, or never treat this case.

The Pearson chi-square test of association was used to test for significant association between variables. In cases where one variable was quantitative and the other categorical, a nonparametric test was used to compare the mean ranks. Where both variables were quantitative, Spearman's rank correlation coefficient was performed to test for a linear association. The level of significance was determined to be $P < .05$.

Table 2. Teaching Positions and Additional Invisalign® Training^a

	Specialty	Response		P Value of Chi-Square Test
		Yes	No	
Teaching position	Ortho	22	44	.054
	GP	18	73	
Additional Invisalign training	Ortho	48	17	.006
	GP	47	43	

^a GP indicates general practitioner; Ortho, orthodontist.

Table 3. Orthodontic Continuing Education (CE) Courses Excluding Invisalign®

Response, %	Number of Continuing Education Courses				
	0–5	6–10	11–15	16–20	>20
	73.3	11.1	1.1	4.4	10.0

RESULTS

Of the 406 questionnaires mailed, 160 were returned, for a total response rate of 39%. The response rate was 55% for orthodontists and 33% for general practitioners.

Background Information

In this sample, no significant difference was noted between general practitioners and orthodontists in the mean number of years in practice (Table 1) or in the number of teaching positions held at dental training facilities (Table 2).

Significant differences were found for years certified in Invisalign® (Table 1) and for additional training in Invisalign® after initial certification (Table 2). Years in practice were linearly associated with years certified in Invisalign® ($P < .0001$).

Excluding Invisalign® courses, approximately 27% of general practitioners reported taking more than five continuing education courses in orthodontics (Table 3).

Invisalign® Experience

Table 4 summarizes the data collected in the Invisalign® Experience section of the questionnaire.

Statistically significant differences were found relative to the number of cases started and the percentage of cases started in the last 12 months. No differences were found in the percentage of cases completed, the percentage of cases that finished on time, the percentage of cases with midcourse correction, and the number of ClinChecks without modification from the last 10 cases (Table 4).

Data from the Background section were compared with those on the Invisalign® Experience section. Years in practice were linearly associated with Invisalign® cases started ($P < .0001$). Linear relationships were also found for years certified in Invisalign®, Invisalign® cases started, and the percentage of Invisalign® cases completed. An inverse linear relationship was found for years certified in Invisalign® and for percentage of Invisalign® cases started in the last 12 months (Table 5).

Initial Certification

Participants were asked to rate how comfortable they felt after their initial certification in treating patients

Table 4. Descriptive Statistics and Rank Test for the Invisalign® Experience Section^a

		Mean	SD	P Value
Invisalign® cases started	Ortho	102.7	180.9	<.0001
	GP	19.1	22.4	
% of Invisalign® cases started in the last 12 months	Ortho	33.4	26.5	.0012
	GP	47.9	31.0	
% of Invisalign® cases completed	Ortho	60.5	26.5	.1
	GP	52.9	28.1	
% of Invisalign® cases finished on time	Ortho	55.0	29	.86
	GP	53.3	30.5	
% of Invisalign® cases with midcourse corrections	Ortho	30.1	24.5	.16
	GP	25	21.5	
ClinChecks without modification from the last 10 cases	Ortho	1.0	2.2	.14
	GP	1.5	2.0	

^a GP indicates general practitioner; Ortho, orthodontist.

with Invisalign® and in understanding how Invisalign® works. Most general practitioners and orthodontists were not comfortable after their initial certification in treating patients with Invisalign® and in understanding how Invisalign® works (Table 6).

Case Selection

Case 1 demonstrated a Class I malocclusion with a normal overjet and overbite, mild spacing in the maxillary arch, and mild crowding in the mandibular arch (Figure 1). The participants' responses are summarized in Table 7.

Case 2 showed a Class I malocclusion with a normal overjet, a deep overbite, and mild crowding in both arches (Figure 2). The responses are summarized in Table 8.

The pictures for the third case displayed a Class I malocclusion with a normal overjet and overbite, a significant maxillary midline diastema, mild spacing in the maxillary arch, and mild crowding in the mandibular arch (Figure 3). The responses are summarized in Table 9.

Case 4 was a Class I malocclusion with a minimal overjet, a deep overbite, reclined maxillary central incisors, and moderate crowding in both arches (Figure 4). The responses are summarized in Table 10.

Table 5. Spearman Correlation Coefficient With Years Certified in Invisalign®

	Correlation Coefficient	P Value
Invisalign® cases started	0.650	<.0001
% of Invisalign® cases started in the last 12 months	-0.581	<.0001
% of Invisalign® cases completed	0.504	<.0001
% of Invisalign® cases finished on time	-0.004	.9660
% of Invisalign® cases with midcourse corrections	0.064	.4443
ClinChecks without modification from the last 10 cases	-0.013	.8757

Case 5 presents a Class II division I subdivision malocclusion with a normal overjet, a deep overbite, mild crowding in the maxillary arch, and moderate crowding in the mandibular arch (Figure 5). The responses are summarized in Table 11.

Case 6 was a Class I malocclusion with a normal overjet, a deep overbite, asymmetric midlines, severe crowding in both arches, and extensive attrition of the incisors (Figure 6). The responses are summarized in Table 12.

To analyze the data, each response choice was assigned a number (1–6). The response choices were analyzed individually and then were grouped together to create additional choices for further testing (Table 13).

When all the response choices were considered (1/2/3/4/5/6), significant differences were seen between the way orthodontists and general practitioners responded to Cases 3 and 5. The greatest number of significant differences was seen in Cases 3, 5, and 6 when the responses were grouped as treat this case with Invisalign®, never treat this case with Invisalign®, and never treat this case (1–4/5/6) (Table 14).

DISCUSSION

In this study, the surveyed population was derived from the Invisalign® provider search engine.⁸ Initially, all certified Invisalign® providers were listed. However, shortly after this study was begun, Align's criteria for inclusion in this search engine changed according to the number of cases submitted for treatment. To eliminate this bias, we used a provider list that was generated before this change was made. The number of participants surveyed was limited to a 35-mile radius to stay within the budget constraints of this study. The 35-mile radius yielded a list of 406 participants. The search engine identified practitioners only as orthodontists or general dentists. Other specialties were grouped together with general dentists. It is unknown

Table 6. Initial Certification^a

		Response, %				
		Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
Comfortable treating patients with Invisalign®	Ortho	2	18	20	45	15
	GP	1	11	17	60	11
Comfortable understanding how Invisalign® works	Ortho	2	6	11	50	32
	GP	1	8	7	58	27

^a GP indicates general practitioner; Ortho, orthodontist.



Figure 1. Case 1.

Table 7. Responses to Case 1^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	73	18	7	0	1	0
GP	61	32	6	0	0	0

^a GP indicates general practitioner; Ortho, orthodontist.



Figure 2. Case 2.

Table 8. Responses to Case 2^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	49	46	3	0	1	0
GP	65	35	0	0	0	0

^a GP indicates general practitioner; Ortho, orthodontist.

to what extent this may have affected the results of this study.

The patients used in this study were all treated with Invisalign®. An attempt was made to present the cases in an increasing level of difficulty to treat with Invisalign® as described in the *Invisalign® Treatment Planning Guide (ITPG)*.⁹ Response choices for the case selection part of the study were derived using the categories described in the *ITPG*. Providers who have completed up to 15 cases are considered Initiators. Those who have completed between 16 and 50 cases are considered Experienced Providers, and those who have completed more than 50 cases are considered Advanced Providers.

More than 90% of orthodontists and general practitioners considered Cases 1 and 2 to be good

cases to treat as their first or their second to fifteenth Invisalign® case. This is consistent with Align’s recommendations for Initiators.⁷

It was significant to find that 89% of orthodontists would treat Case 3 with Invisalign® as compared with only 61% of general practitioners. A significant difference in the distribution of responses was also noted.

No differences were seen in the responses to treating Case 4. Most responses for both groups were second to fifteenth, indicating that respondents believe this case should be treated by Initiators.

With Case 5, significant differences were seen in the response distribution. Most orthodontists would not treat this case with Invisalign®; however, most general practitioners would treat this case with Invisalign® at



Figure 3. Case 3.

Table 9. Responses to Case 3^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	22	48	18	1	10	0
GP	6	41	10	4	25	13

^a GP indicates general practitioner; Ortho, orthodontist.

the Initiator level. This difference may be due to different treatment goals based on educational differences.^{1,3}

Over 70% of orthodontists and general practitioners would not treat Case 6 with Invisalign®. However, significant differences were evident when the response categories were grouped (Tables 13 and 14). Ninety-seven percent of the orthodontists who would not treat this case with Invisalign® would still treat the case. Only 56% of the general practitioners who would not treat this case with Invisalign® would still treat this case. Educational differences in clinical training with fixed appliance treatment may account for this finding.^{1,3}

It was not surprising to find that orthodontists started significantly more Invisalign® cases than were started

by general practitioners because orthodontists had a 4-year head start on Invisalign® certification.⁷ However, it was interesting to learn that general practitioners started significantly more Invisalign® cases than were started by orthodontists in the last 12 months before the survey was conducted. This may be related to an increase in the number of general practitioners providing Invisalign® care and to a decrease in the number of patients being referred by the general practitioner to the orthodontist for treatment.

For orthodontists and general practitioners, an inverse relationship was noted in the percentage of cases started in the last 12 months before the survey was conducted and years certified with Invisalign®. It may be that the novelty of this technique has diminished, and that its limitations relative to fixed



Figure 4. Case 4.

Table 10. Responses to Case 4^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	21	42	25	4	7	0
GP	11	55	20	4	8	6

^a GP indicates general practitioner; Ortho, orthodontist.



Figure 5. Case 5.

Table 11. Responses to Case 5^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	9	19	22	9	40	0
GP	6	66	17	3	19	6

^a GP indicates general practitioner; Ortho, orthodontist.



Figure 6. Case 6.

Table 12. Responses to Case 6^a

	Response, %					
	1st Case	2nd–15th Case	16th–50th Case	>50th Case	Never Treat This Case With Invisalign®	Never Treat This Case
Ortho	2	8	8	14	68	2
GP	0	10	17	0	41	32

^a GP indicates general practitioner; Ortho, orthodontist.

Table 13. Number Assignment of Response Choices and Response Groups

#	1/2/3/4/5/6	Response Groups			
		1-4/5/6	1-4/5-6	1/2/3/4	1-4/5
1	1st Case	Treat this case with	Treat this case with Invisalign®	1st Case	Treat this case with
2	2nd-15th Case	Invisalign®		2nd-15th Case	Invisalign®
3	16th-50th Case			16th-50th Case	
4	>50th Case			>50th Case	
5	Never treat this case with Invisalign®	Never treat this case with Invisalign®	Never treat this case with Invisalign® and Never treat this case	—	Never treat this case with Invisalign®
6	Never treat this case	Never treat this case		—	—

1-4 and 5-6 indicate response choices were grouped together.

Table 14. P Value of Chi-Square Tests Between Practitioners and Case Responses

	Response Groups				
	1/2/3/4/5/6	1-4/5/6	1-4/5-6	1/2/3/4	1-4/5
Case 1	*	*	*	.13	*
Case 2	*	*	*	*	*
Case 3	<.001	<.001	<.001	.14	<.001
Case 4	*	.01	.19	*	.19
Case 5	<.001	.005	.08	.008	.08
Case 6	*	<.001	.73	*	.73

* Insufficient data in some of the response choices to perform test.

appliance treatment are beginning to discourage practitioners from using it as much as they originally did.

CONCLUSIONS

- Differences have been noted in the use of Invisalign® by orthodontists and by general practitioners.
- Orthodontists and general practitioners who have been practicing longer have been certified in Invisalign® longer and have started more Invisalign® cases than those practicing for less time.
- Orthodontists and general practitioners who have been certified in Invisalign® longer have started and completed more cases than those certified for less time.
- Orthodontists have started and completed more Invisalign® cases than have general practitioners.
- Over the last 12 months before the survey was conducted, general practitioners started more Invisalign® cases than were started by orthodontists.
- For both groups, the longer practitioners were certified in Invisalign®, the fewer cases they started over the last 12 months.
- Most orthodontists and general practitioners agree that mild Class I malocclusions were considered good cases to treat by less experienced Invisalign® providers.

- A significant difference in opinion was noted between practitioners as to what level of experience an Invisalign® provider should have before treating a Class I malocclusion with a large midline diastema, or whether a Class II subdivision case should be treated with Invisalign®.
- Most orthodontists and general practitioners would not treat severe Class I malocclusions with Invisalign®.

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