

## Pain and Orthodontic Treatment

### *Patient Experiences and Provider Assessments*

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#### ABSTRACT

**Objective:** To explore whether patients' pain experiences and orthodontists' assessments of their patients' pain levels are consistent and whether orthodontists are aware of their patients' use of pain medication.

**Materials and Methods:** Survey data were collected from 116 adolescent patients (44 male, 72 female; aged 10 to 19 years; mean age, 14.27 years) and from their orthodontic care providers.

**Results:** While only 18.0% of these patients agreed that they had pain during their last orthodontic appointment, 58.5% indicated that they experienced pain for a few days after their appointment. On average, dentists underestimated the patients' pain during the last appointment (rated on a 5-point scale, with 1 indicating *no pain*: providers = 2.01 vs patients = 2.28;  $P = .042$ ), immediately after the last appointment (1.93 vs 2.34;  $P = .005$ ), and 1 day (1.77 vs 2.53;  $P < .001$ ) and 2 days (1.57 vs 2.19;  $P < .001$ ) after the previous appointment. Only 26.5% of the patients used pain medication immediately following and 1 day after the last appointment. Providers underestimated the amount of medication used.

**Conclusion:** Orthodontists underestimated the degree to which orthodontic treatment caused pain for their patients and their patients' use of pain medication. (*Angle Orthod.* 2009;79:1175–1181.)

**KEY WORDS:** Pain; Pain management; Quality of life; Orthodontic treatment

#### INTRODUCTION

Every year, more than 5.75 million patients seek orthodontic treatment in the United States and Canada, a number that has grown by 43.75% over the past 10 years.<sup>1</sup> Research shows that 90% of orthodontic patients reported that their treatment was painful and 30% considered ceasing treatment prematurely because of the pain they experienced.<sup>2</sup> Communicating with patients about pain and pain management should therefore be part of patient-orthodontist interactions.

Patients' pain is one aspect of oral health-related quality of life (OHRQOL), a relatively new concept in the oral health sciences.<sup>3</sup> Poor oral health can affect physical, psychological, and social conditions, which in turn affect patient's quality of life (QOL).<sup>4,5</sup> Researchers have therefore suggested that OHRQOL be included when assessing a patient's treatment needs and outcomes.<sup>4,6–9</sup> In orthodontics, researchers have assessed OHRQOL in connection with orthodontic treatment outcomes, such as in studies of how patients' QOL is affected by improvements in appearance and functioning after treatment is concluded.<sup>4–6,10–12</sup> However, research on orthodontic patients' QOL during their treatment is scarce.<sup>5,6,8</sup> It is well accepted that orthodontic treatment affects patients' appearance, speech, ability to take in nutrition, and their social interactions.<sup>5,6</sup> Understanding how patients' pain experiences during their treatment affect their QOL is important because pain/discomfort is one main component of patients' QOL and the absence of pain/discomfort is important for achieving a high QOL.<sup>3,4,8,10</sup> For patients, pain might even be the most significant side effect of orthodontic treatment and one of the primary reasons for noncompliance.<sup>13–17</sup> Pain from orthodontic treatment has been shown to have negative effects on

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oral hygiene efforts and to be a major reason for missing appointments<sup>14,18</sup>; in addition, almost all orthodontic patients reported pain when chewing and biting food, causing them to change their diet.<sup>5,19,20</sup> Finally, pain and discomfort during orthodontic treatment has been shown to affect a patient's overall satisfaction with their orthodontic treatment outcomes.<sup>21</sup>

Given that pain affects patients' QOL and treatment cooperation, discussing pain management should be part of the communication between patients and orthodontists. If orthodontists are able to support their patients' efforts to prevent or manage pain, their patients would have a better QOL and might be more willing to cooperate with treatment recommendations. However, research suggests that pain management has been largely neglected and that orthodontic education lacks pain management training.<sup>22</sup> There seems to be a consensus that pain management merely requires common sense and the ability to follow basic medication procedures. Other researchers have shown that it is difficult for health professionals to communicate effectively about pain and for orthodontists to predict patients' pain responses to treatment.<sup>23,24</sup> This situation is unfortunate because patients' pain can be decreased when the patient is well informed about how much pain to expect,<sup>14</sup> and patients' expectations are greatly influenced by information from providers and memories of past experiences. When patients receive information about the level of pain they might experience, they gain an increased sense of control, and as a result, pain can be reduced.<sup>25,26</sup> It would therefore be helpful if orthodontists could communicate to patients how much pain they might experience. While research has explored patients' pain experiences during orthodontic treatment,<sup>2,12,14,23-27</sup> no research has yet analyzed whether orthodontists can accurately assess their patients' level of pain. Given that patients and clinicians may not rate treatment outcomes similarly,<sup>11</sup> one might expect that there is also a disconnect between patients' pain experiences and orthodontists' perceptions of their pain.

In addition to exploring whether orthodontists can accurately assess their patients' pain, it is also interesting whether they engage in effective communication about pain management. Research showed that nonsteroidal anti-inflammatory drugs (NSAIDs) are the preferred over-the-counter medications for orthodontic pain.<sup>18,28</sup> While high doses of NSAIDs have been reported to disrupt tooth movement, over-the-counter doses have not been shown to affect tooth movement.<sup>28,29</sup> Some studies reported similar levels of pain relief with NSAIDs and acetaminophen.<sup>17,26,29</sup> Other pain medications studied include aspirin, which was found to be less effective than other NSAIDs and should not be used by children, and valdecoxib, a

COX-2 inhibitor that has been removed from the US market due to adverse cardiovascular effects. Other more nontraditional methods of pain relief include low-level laser therapy, transcutaneous electrical nerve stimulation, vibratory stimulation, and analgesic gum.<sup>2,13,16,18,19,29</sup> Premedication with an NSAID such as ibuprofen or naproxen sodium has been found to be effective in managing orthodontic pain.<sup>17,28</sup> Research showed that these medications delayed the onset of pain and decreased initial pain experiences if taken 1 hour before certain orthodontic procedures and that preprocedural and postprocedural pain medication gave the most effective and long-lasting pain relief.<sup>16-18,28</sup>

Despite these research findings, there is no standard of care for analgesic use in the pain management of orthodontic patients. It is more common for orthodontists to simply tell their patients to take analgesics as needed, leaving pain management decisions up to their mostly adolescent patients and their parents.<sup>17,18,28</sup> In fact, despite the known effectiveness of various analgesics, there is surprisingly little use of these medications among patients.<sup>16</sup> This study therefore investigated how much pain was reported by orthodontic patients and perceived by their orthodontists, how much pain medication patients used, and whether orthodontists knew whether their patients had used medication.

## MATERIALS AND METHODS

This study was approved by the Institutional Review Board for the Health Sciences at the University of Michigan (HUM00010208). Survey data were collected from 116 adolescent patients (44 males, 72 females; average age: 14.33 years; age range, 11-21 years; European American, 80.2%) of a pediatric clinic at a dental school and their 14 graduate student providers (6 men, 8 women). The inclusion criteria were that the patients were younger than 22 years and gave written assent and that their parents gave written consent and signed a HIPAA form. Approximately 90% of the patients who were informed about the study participated. The providers of all participating patients responded to a provider survey.

The patients were asked if they would participate in this study upon arrival for a regularly scheduled appointment. If they agreed, they responded to a patient survey in the waiting room area after their appointment was completed. The patients were assured that their provider would not see their responses. After the patients had left, their provider was informed that their patient had participated in the study and then completed the provider survey. The patients' names were recorded on the patient and provider surveys to allow

**Table 1.** Percentages of Patients' Responses and Average Reported Pain Scores

	1 = <i>Disagree Strongly</i> , 2 = <i>Disagree</i>	3 = <i>Neither</i> <i>Disagree nor Agree</i>	4 = <i>Agree</i> ; 5 = <i>Agree Strongly</i>	Mean/SD
I have pain during appointments.	42%	40%	18%	2.6/1.05
I have pain for a few days after an appointment.	21%	21%	59%	3.6/1.13
Pain from the braces affects my daily life.	76%	12%	13%	1.9/1.08
Pain from my braces causes me to change my diet.	57%	21%	22%	2.4/1.27
My teeth hurt when I chew or bite.	75%	16%	10%	1.9/1.06
Pain makes it difficult for me to brush my teeth.	63%	24%	14%	2.1/1.13
Pain makes it difficult for me to floss my teeth.	56%	18%	28%	2.4/1.36

merging of the data. The providers responded after the patient had been dismissed, and providers and patients could therefore not compare notes while they were responding to the surveys.

The patient survey assessed the patients' sociodemographic background, their experienced pain, and use of pain medication during and after the last and current appointment. The providers assessed their patients' pain levels and indicated whether their patients used pain medication. The data were analyzed with SPSS (version 16.0; Chicago, Ill).

## RESULTS

The patients' pain experiences were assessed with questions concerning how much pain the patients experienced during and following their appointments and their QOL, with questions about how pain from orthodontic treatment had affected their life. Only 18% of the patients agreed or agreed strongly with the statement "I have pain during appointments," and only 12.6% agreed or agreed strongly that pain from the braces affect their daily lives (see Table 1). However, 58.5% agreed or agreed strongly with the statement "I have pain for a few days after an appointment," and 21.9% reported that pain due to the braces caused them to change their diet.

Additional questions asked the patients to report pain experiences during, immediately following, 1 and 2 days after the last appointment, and during the current appointment. The patients responded to these questions on a 5-point scale ranging from 1 = *no pain at all* to 5 = *very much pain*. The providers evaluated the patients' pain levels for the same five times using an identical answer scale. A comparison of the average patient and provider responses with independent-sample *t*-tests showed that the providers underestimated how much pain their patients had had during the last appointment (2.01 vs 2.28;  $P = .042$ ), immediately after the last appointment (1.93 vs 2.34;  $P = .005$ ), and 1 day (1.77 vs 2.53;  $P < .001$ ) and 2 days after the last appointment (1.57 vs 2.19;  $P < .001$ ; see Table 2). There was no difference in the average pa-

tient and provider responses concerning the pain during the current appointment.

In addition to comparing the average responses, Table 2 also reports the percentages of providers who underestimated/overestimated their patients' pain responses and who assessed their patients' pain consistently with their patients' assessments. A chi-square test was used for each of the five points in time to compare the percentages of consistent vs inconsistent assessments. For each point in time, providers made more inconsistent than consistent pain assessments. Figure 1 provides a graphic depiction of the percentages of consistent versus inconsistent patient-provider pain assessments. The largest percentages of responses were those that indicated that the providers underestimated their patients' pain. In fewer cases, the providers overestimated their patients' pain. Only about a third of the responses showed consistent patient-provider assessments.

In addition to analyzing the match between patients' and providers' pain assessments, this study also explored (1) whether patients used pain medication and (2) whether the providers knew if the patients used medication. The patients reported their use of pain medication before, immediately following, and 1 and 2 days after the last appointment as well as before the current appointment. The providers indicated whether they thought that the patient would need to use pain medication at the same points in time. Table 3 provides information about the percentages of patients who had used versus not used pain medication at the five time points of interest and whether the providers thought that their patients had used versus had not used pain medication at these time points. Figure 2 provides a graphic depiction of this information. This figure shows that most patients did not use pain medication at any points in time and that most providers assessed this situation consistently. However, substantial percentages of patients did actually use pain medication, and their providers were not aware of this fact. For example, 22 patients used pain medication immediately following the last appointment and 23 on

**Table 2.** Pain Reports of Patients and Providers About the Last and Current Appointment

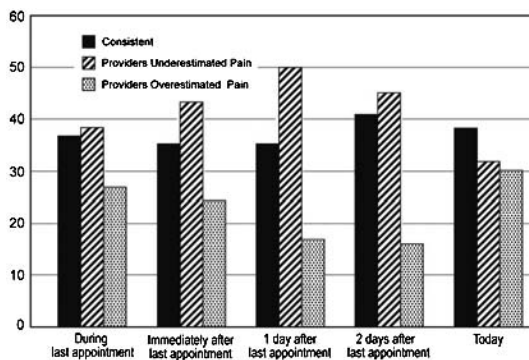
Pain	Patients/Providers	Mean <sup>a</sup>	% Providers Who Underestimated	% Providers Who Were Consistent	% Providers Who Overestimated <sup>b</sup>
During last appointment	Patients	2.3 <sup>c</sup>	1 point: 20%	36%	1 point: 19%
	Providers	2.0 <i>P</i> = .042	2 points: 14% 3 points: 2% 4 points: 2% Total: 38%		2 points: 8% 3 points: 0% 4 points: 0% Total: 27% <i>P</i> = .006
Immediately following the last appointment	Patients	2.3	1 point: 18%	34%	1 point: 14%
	Providers	1.9 <i>P</i> = .005	2 points: 17% 3 points: 7% 4 points: 1% Total: 43%		2 points: 5% 3 points: 3% 4 points: 0% Total: 23% <i>P</i> = .002
One day after the last appointment	Patients	2.5	1 point: 17%	34%	1 point: 6%
	Providers	1.8 <i>P</i> < .001	2 points: 15% 3 points: 18% 4 points: 0% Total: 50%		2 points: 11% 3 points: 0% 4 points: 0% Total: 17% <i>P</i> = .002
Two days after the last appointment	Patients	2.2	1 point: 19%	40%	1 point: 10%
	Providers	1.6 <i>P</i> < .001	2 points: 13% 3 points: 10% 4 points: 3% Total: 45%		2 points: 4% 3 points: 2% 4 points: 0% Total: 16% <i>P</i> = .048
During today's appointment	Patients	2.02	1 point: 24%	38%	1 point: 24%
	Providers	2.00 ns	2 points: 5% 3 points: 3% 4 points: 0% Total: 32%		2 points: 6% 3 points: 0% 4 points: 0% Total: 30% <i>P</i> = .016

<sup>a</sup> Independent-sample *t*-tests were used to test the differences in the average responses of the patients and providers.

<sup>b</sup> Chi-square tests were computed for each of the five time points to assess whether the percentages of consistent answers vs inconsistent answers differed significantly.

<sup>c</sup> The answers were given on 5-point scales ranging from 1 = *disagree strongly* to 5 = *agree strongly*.

the day after the appointment, while their providers did not report that they thought their patient would take pain medication (see Table 3).



**Figure 1.** Percentages of providers who underestimated, overestimated, or correctly assessed their patients' pain.

## DISCUSSION

As predicted by earlier research,<sup>2</sup> more than half of the patients (58.5%) agreed or agreed strongly with the statement "I have pain for a few days after an appointment," and an additional 20.7% answered this question in a neutral fashion but did not disagree or disagree strongly with this statement (see Table 1). While fewer patients reported pain during appointments and negative consequences of having pain, it is obvious that pain from orthodontic treatment had an effect on their QOL and affected their daily activities. Consistent with earlier studies,<sup>14,18-20</sup> significant percentages of patients reported that pain caused changes in their diet and had negative effects on brushing and flossing, showing that pain is a crucial aspect of orthodontic treatment.

One interesting question is whether orthodontists can accurately assess whether their patients experi-

**Table 3.** Cross-tabulations of the Patient and Provider Responses Concerning the Use of Pain Medication

Patient Responses <sup>a</sup>	Time	Provider Responses <sup>b</sup>		
		No Pain Medication	Yes—Pain Medication	
No pain medication	Before last appointment	88% <sup>c</sup>	<i>P</i> = .071	1%
	Immediately after last appointment	69%	<i>P</i> = .041	4%
	One day after last appointment	70%	<i>P</i> = .060	3%
	Two days after last appointment	84%		2%
	Before today	95%		0%
Yes—pain medication	Before last appointment	10%		1%
	Immediately after last appointment	21%		5%
	One day after last appointment	23%		4%
	Two days after last appointment	13%		1%
	Before today	5%		0%

<sup>a</sup> The patients were asked to respond to the questions, “Did you take any pain medication before the last appointment?”, “. . . immediately after the last appointment?”, “. . . 1 day after the last appointment?”, “. . . 2 days after the last appointment?”, and “. . . before today’s appointment?”

<sup>b</sup> The providers were asked to respond to the questions, “Do you think your patient took pain medication before the last appointment?”, “. . . immediately after the last appointment?”, “. . . 1 day after the last appointment?”, “. . . 2 days after the last appointment?”, and “. . . before today’s appointment?”

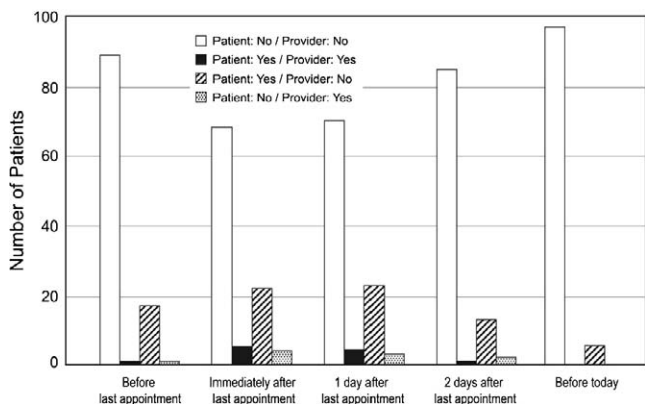
<sup>c</sup> For the responses concerning each of the five points in time, chi-square tests were used to test whether the patient and the provider responses concerning the use of pain medication were consistent or inconsistent.

ence pain. Based on research that reports a lack of emphasis on pain communication and management in orthodontic training,<sup>22–24</sup> it was predicted that there would be significant inconsistencies between patients’ and providers’ pain assessments. The results supported this hypothesis. On average, providers expected their patients to have less pain than the patients reported. It is especially interesting to note that not one provider indicated that their patient would experience the highest level of pain that could be expressed on the pain scale, namely, a value of 5, while quite a number of patients reported this high level of pain. The fact that the providers never reported the highest pain level might indicate that they are not aware that patients can experience that much pain.

In addition, it is also interesting to explore whether providers differed in how accurately they could iden-

tify their patient’s level of pain. A consistency score was therefore computed for each of the five pain items (pain during/immediately following/1 day after and 2 days after last appointment/during today’s appointment) by comparing the patient and provider responses. A patient-provider consistency received a score of 1, and an inconsistency received a score of 0. The sum of the five scores was used as an index of provider accuracy. A univariate analysis of variance with the independent variable “provider” and the dependent variable “number of consistent responses” showed that the providers did not differ in the average number of correct responses. In addition, an independent *t*-test was conducted to compare the average number of consistent responses of male versus female providers. Again, there was no significant difference in the number of consistent responses of male and female providers. However, it is possible that the fact that these providers were all socialized in the same educational setting could have affected their responses and that providers educated in different settings might differ in their abilities to accurately perceive pain.

In addition, it is also interesting to explore the patients’ use of pain medication and the providers’ awareness of this use. In general, pain medication use was low despite significant reports of pain. Despite a lack of research concerning the ability of orthodontic providers to accurately assess if and when their patients need pain medication, the reported lack of emphasis on pain management during orthodontic training in the literature<sup>23,24</sup> suggests that providers may be ill-equipped to make these assessments. This hypo-



**Figure 2.** Percentages of providers who underestimated, overestimated, or correctly assessed their patients’ use of pain medication.

esis was supported by the findings that significant percentages of providers underestimated their patients' use of pain medication. This lack of awareness might be related to the degree to which providers underestimated their patients' pain due to their orthodontic treatment.

In summary, large percentages of orthodontists underestimated their patients' pain in connection with orthodontic treatment and were not aware that their patients used pain medication. Given that prior research showed that pain is one of the primary reasons for patients' noncompliance<sup>13-17</sup> and is a major reason for missing appointments,<sup>14,18</sup> it seems crucial to educate providers more comprehensively about (1) how to predict pain more accurately and (2) how to communicate with patients successfully about pain management strategies. Despite the research evidence that preprocedural and postprocedural doses of pain medication will give the most effective and longest lasting pain relief,<sup>16-18,28</sup> patients rarely used this approach to manage their pain. Pain management decisions should not be left up to adolescent orthodontic patients and their parents<sup>17,18,28</sup> but should instead be based on a standard of care for analgesic use in the pain management of orthodontic patients. Future research should explore whether increased patient-provider communication about pain management could improve patients' QOL during orthodontic treatment and ultimately their treatment cooperation and satisfaction.

## CONCLUSIONS

- Substantial percentages of patients reported having experienced pain during and following their orthodontic treatment visits and negative effects of this pain on their lives.
- On average, orthodontists underestimated the degree to which orthodontic treatment caused pain. In addition to the inconsistency between the patients' reported pain and their provider's assessment of pain, providers also underestimated how many of their patients use pain medication.
- A general lack of utilization of pain medication was found.

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