Observational Study

Dentist’s distress in the management of chronic pain control
The example of TMD pain in a dental practice-based research network

Yoko Yokoyama, MPH, PhD, Naoki Kakudate, DDS, PhD, Futoshi Sumida, DDS, Yuki Matsumoto, DDS, Valeria V. Gordan, DDS, MS, Gregg H. Gilbert, DDS, MBA

Abstract
We aimed to obtain greater understanding of dentists’ distress when they diagnose and treat patients with temporomandibular disorders (TMD), and to explore ways in which TMD can be better treated.

We conducted a cross-sectional study based on a questionnaire survey of dentists (n = 148). Dentists were queried using an open-ended questionnaire about distress they experienced when treating patients with TMD. Survey responses were analyzed using mixed methods. Associations between specific dentist and patient characteristics and types of distress were analyzed by one way analysis of variance and residual analysis.

One hundred thirteen clinicians responded to the questionnaire, giving a 76% response rate. Thematic analysis identified 6 major themes: difficulty in predicting therapeutic effect and prognosis; difficulty in diagnosis; difficulty in the decision about whether to do occlusal adjustment; difficulty in specifying a cause; difficulty in communicating with patients and mental factors; and health insurance system barriers. Clinicians who reported difficulty in deciding whether to do occlusal adjustment saw significantly more patients who experienced shoulder stiffness and headache (P = .008 and P = .022, respectively). Dentists’ knowledge of TMD guidelines was associated with a lower percentage of difficulty in predicting therapeutic effect and prognosis (residual analysis; P = .010).

These findings provide important insights into clinician’s perception of difficulties with patients experiencing TMD-related pain. Knowledge of the existence of TMD clinical practice guidelines may lower dentist distress, particularly with regard to prognosis. Further studies are needed to decrease dentist’s distress and to overcome the evidence-practice gap in TMD treatment.

Abbreviations: ANOVA = analysis of variance, JDPBRN = Dental PBRN Japan, PBRN = Practice-Based Research Network, SD = standard deviation, TMD = temporomandibular disorders.

Keywords: clinicians’ distress, evidence-practice gap, mixed methods, pain, practice-based research, temporomandibular disorders

1. Introduction
Temporomandibular disorders (TMD) are among the most frequent musculoskeletal pain conditions, affecting around 5% to 12% of the US population[1] and 3% of Japanese population.[2] Long-standing controversy over the diagnosis and treatment of TMD continues,[3–6] and no initial management of TMD-related pain for general dentists has yet been standardized. A recent study by the National Dental Practice-Based Research Network (PBRN) and Dental PBRN Japan (JDPBRN) identified significant variation among practicing dentists regarding TMD-related pain.[1] For example, 64% of US dentists[1] and 58% of

Editor: Bernhard Schaller.

Certain components of this work were supported by the National Institutes of Health (grant U19-DE-22516). Opinions and assertions contained herein are those of the authors and are not to be construed as necessarily representing the views of the respective organizations or of the National Institutes of Health. The funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Two authors are dentists employed by a dental clinic (Dr. Futoshi Sumida: Mikami Dental and Orthodontics Clinic, and Dr. Yuki Matsumoto: Matsumoto Dental Clinic). This does not alter the author’s adherence to all the International Dental Journal policies on sharing data and materials.

*Graduate School of Media and Governance, Keio University, Fujisawa City, Kanagawa, *Division of Clinical Epidemiology, Kyushu Dental University, Kitakyushu, Fukuoka, Japan. *University of Florida College of Dentistry, Gainesville, FL. *Mikami Dental and Orthodontics Clinic, Tomakomai, Hokkaido, *Matsumoto Dental Clinic, Okazaki, Aichi, Japan. *Department of Restorative Dental Sciences at the University of Florida College of Dentistry, Gainesville, FL. *Department of Clinical and Community Sciences, School of Dentistry, University of Alabama at Birmingham, Birmingham, AL.

Correspondence: Naoki Kakudate, Division of Clinical Epidemiology, Kyushu Dental University, Kitakyushu, 2-6-1, Manazuru, Kokura-ku, Kitakyushu, Fukuoka, 803-8580, Japan, University of Florida College of Dentistry, 1395, P.O. Box 100405, Gainesville, FL 32610 (e-mail: info@dentalpbrn.jp).

Copyright © 2018 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Medicine (2018) 97(1)e9553
Received: 19 June 2017 / Received in final form: 22 November 2017 / Accepted: 13 December 2017
http://dx.doi.org/10.1097/MD.0000000000009553

1
Japanese dentists\textsuperscript{[7]} reported using occlusal adjustment, despite the fact that the clinical practice guideline\textsuperscript{[8]} recommends against occlusal adjustment as initial treatment for TMD because of its irreversibility and uncertainty over its effectiveness. These findings suggest the presence of an evidence-practice gap in clinical practice for TMD-related pain. These circumstances might lead to a worsening of the difficulties already experienced by dentists in the diagnosis and treatment of TMD. Previous studies suggest that TMD-related pain impacts patients’ lives strongly and is connected with feelings of hopelessness and despair.\textsuperscript{[9–11]} A qualitative interview study revealed that dentists recognized that psychological factors play an important role in the development and maintenance of TMD-related pain and felt inadequately equipped to manage this condition.\textsuperscript{[12]} A previous study suggested that about 50% of dentists felt insecure concerning TMD diagnostics, therapy decisions and treatment, and there is high need for offering continuing education in TMD.\textsuperscript{[13]} A systematic review suggested that understanding clinicians’ perceived barriers or misperception is important in bridging the evidence-practice gap, and that identifying these factors is better done using qualitative methods.\textsuperscript{[14,15]} To our knowledge, however, dentist distress regarding TMD-related pain has not been evaluated. Understanding this distress may aid in bridging the evidence-practice gap. Therefore, the objectives of this study were to evaluate dentist distress when seeing patients with TMD-related pain quantitatively and identify specific characteristics that are significantly associated with dentist distress quantitatively.

\section{2. Methods}

\subsection{2.1. Study design}

The study was conducted using a cross-sectional design based on a questionnaire survey that used mixed methods integrating both quantitative and qualitative data in the study.\textsuperscript{[13]} Approval was obtained from the Institutional Review Board of Kyushu Dental University (No. 13-73) and the study was conducted in accordance with the World Medical Association Declaration of Helsinki. Participants were provided informed consent prior to participation.

\subsection{2.2. Participants}

The study evaluated dentists working in outpatient dental practices and affiliated with the JDPBRN (n = 148). The JDPBRN is a research network and consortium of dental practices with a broad representation of practice types, treatment philosophies, and patient populations, and has a shared mission with the DPBRN,\textsuperscript{[16]} now called the National Dental PBRN (http://NationalDentalPBRN.org). Participants were enrolled via the JDPBRN website (http://www.dentalpbrn.jp/) and a targeted mail campaign. The JDPBRN network regions cover all 7 major districts of Japan, namely Hokkaido, Tohoku, Kanto, Chubu, Kansai, Chugoku-Shikoku, and Kyushu. Each of these regions has a Regional Coordinator, who was tasked with distribution and collection of the questionnaires. Participants completed the questionnaire themselves and mailed it to the Regional Coordinator using a preaddressed envelope. On receipt, the Regional Coordinator reviewed all questionnaires for completeness.

\subsection{2.3. Questionnaire}

Participating dentists were asked about their own and their patients’ demographic information. They were also asked about difficulties experienced by patients in their practice who have TMD pain, such as “cannot eat,” “fear of not being able to open the mouth,” and “shoulder stiffness and headache”; duration of TMD-related pain in their patients; and dentist awareness of the existence of TMD practice guidelines or experience of having read them. In addition, participants were asked about their biggest difficulties when seeing patients with TMD-related pain in an open-ended questionnaire survey. The final version of this questionnaire is available at http://www.dentalpbrn.jp/image/study2questionnaire.pdf.

\subsection{2.4. Qualitative analysis}

Participants were asked to describe their opinions regarding “What is the most distressing aspect for you when you treat patients with TMD-related pain?” in a free answer method. Dentist distress on seeing patients with pain related to TMD was analyzed using thematic analysis, as described by Braun and Clarke.\textsuperscript{[17,18]} Briefly, thematic analysis consists of 6 phases: familiarization with the data, coding, searching for themes, reviewing themes, naming themes, and writing-up the results.\textsuperscript{[18]} All processes were actively discussed among 2 epidemiologists and 2 dentists.

\subsection{2.5. Quantitative analysis (statistical analysis)}

A descriptive analysis was conducted, and the results were expressed in terms of the mean, standard deviation (SD), and frequency. We determined the numbers (percentage) of JDPBRN dentists and patients’ demographics. One-way analysis of variance (ANOVA) and residual analysis were then conducted to examine the relationship between independent variables and the dentists’ distress theme as a dependent variable. The post hoc test (Fisher–Hayter test) was conducted when the results of one way ANOVA were statistically significant. Independent variables were gender, age, percentage of clinicians who knew of the guideline, percentage who had read the guideline, patients with severe TMD-related pain, number of TMD pain patients treated per month, difficulties experienced by patients and duration of pain. Statistical significance was set at \( P < .05 \). All statistical analyses were performed with STATA/SE (version 13; STATA Corporation, College Station, TX).

\section{3. Results}

\subsection{3.1. Demographic information of participants}

Questionnaires were provided to 148 dentists, and 113 (76\%) responses were received. Demographic characteristics are shown in Table 1. Mean age (SD) was 44 ± 11. Participants were mainly male (N = 92, 84\%), and were all Asian by race or ethnicity. Respondents reported that their patients experienced TMD difficulties that included shoulder stiffness (37.5\%), headache (28.8\%), cannot eat (22.7\%), and fear of not being able to open the mouth (14.9\%). Sixty-two (56.9\%) dentists knew of the existence of the TMD practice guidelines and 44 (41.5\%) had read them.

\subsection{3.2. Dentist distress in the management of chronic pain control according to the thematic analysis}

Thematic analysis of the freely descriptive data generated 6 themes, namely difficulty in predicting therapeutic effect and prognosis (N = 33); difficulty in diagnosis (N = 22); difficulty in the decision about whether to do occlusal adjustment (N = 16); difficulty in specifying a cause (N = 13); difficulty in communicating with patients and mental factors (N = 12); and health
insurance system barriers (N = 1). These results are described in Table 2; each theme was supported by more than 12 mentions except theme 6. Since theme 6 was supported by only 1 mention, we excluded theme 6 from further quantitative analysis.

### 3.3. Factors associated with dentist distress in the management of chronic pain control

Factors affecting dentists’ distress in the management of chronic pain control are shown in Table 3. Patient and dentist characteristics were associated with the type of dentist distress in management of chronic pain control. Clinicians who reported difficulties in deciding whether to do occlusal adjustment saw more patients who experience shoulder stiffness and headache (one way ANOVA, P = .008 and P = .022, respectively). Dentists’ knowledge of the TMD guidelines was significantly associated with a lower percentage of dentist difficulties in predicting therapeutic effect and prognosis (residual analysis, P = .010).

### 4. Discussion

The results of this study identified 6 themes of dentists’ perceived distress when managing chronic pain control in TMD. One-way ANOVA and residual analysis suggested that both patient characteristics (such as difficulty with shoulder stiffness and headache) and dentist characteristics (such as knowing of the existence of TMD guidelines) were associated with dentist distress in the management of chronic pain control.

Thematic analysis extracted 6 dentist distress factors in the practice of TMD-related pain, including dentist and patient communication, etiology, diagnosis, treatment, prognosis, and social health insurance system. These results suggest that clinician distress occurs in many areas, including those at the patient level, dentist level, and social health insurance system level. As previously noted, psychological factors play an important role in the management of TMD-related pain,[12] and our analysis also suggested that communication with patients who have psychological factors was difficult. Since TMD-related pain is multidimensional,[19] difficulties in specifying specific causes have been reported. In addition, TMD-related pain is a long-term condition,[19] and dentists felt distress in predicting its therapeutic effect and prognosis. Regarding the social health insurance system, as dentist diagnosis and treatment varies among different kinds of health insurance coverage,[20–27] practice pattern could be largely influenced by the social insurance system.

This study also revealed dentists’ perceived distress over decisions surrounding occlusal adjustment. A previous study suggested that dentists feel inadequately equipped to diagnose or treat TMD-related pain, and that they recognized that psychological factors could play a role in the development and maintenance of TMD-related pain.[12] Although the clinical practice guideline[4] recommends that, because of the irreversible and uncertain nature of TMD, occlusal adjustment should not be

### Table 1

**Distribution of patient and dentist characteristics.**

| Characteristics of patients in the practice (number dentists reporting) | Mean ± SD or number (%) |
|---|---|
| Percentages of each age group (N = 110) | |
| 1–18 (N = 110) | 26.4 ± 12.9 |
| 19–44 (N = 110) | 26.4 ± 12.9 |
| 45–64 (N = 110) | 30.6 ± 11.5 |
| >65 (N = 110) | 28.3 ± 17.1 |
| TMD patients who experience difficult symptoms, % | 22.7 ± 26.4 |
| Cannot eat | 14.9 ± 18.2 |
| Fear of not being able to open mouth (N = 111) | 14.9 ± 18.2 |
| Shoulder stiffness (N = 110) | 37.5 ± 27.1 |
| Headache (N = 110) | 28.8 ± 23.2 |
| Percentages of each duration of pain group | |
| <6 mo (N = 94) | 73.8 ± 22.3 |
| ≥6 mo (N = 91) | 27.1 ± 22.2 |

| Characteristics of the dentist (number dentists reporting) | |
| Gender, male (%) (N = 110) | 92 (84.0) |
| Age, y (N = 110) | 44.3 ± 11.1 |
| Race/ethnicity (Asian) (n = 110) | 110 (100.0) |
| Know of the guidelines, yes (%) (N = 109) | 62 (66.9) |
| Read the guidelines, yes (%) (N = 109) | 44 (41.5) |
| Number who treated TMD over the last 12 mo (n = 110) | 89 (80.9) |
| Number of patients seen each month who have TMD-related pain (n = 89) | 1.9 ± 1.8 |

*Number (%). SD = standard deviation, TMD = temporomandibular disorders.

### Table 2

**Thematic analysis of dentist distress in the management of chronic pain control.**

| Theme | Participants’ quotes | Frequency of mention, N |
|---|---|---|
| Difficulty in predicting therapeutic effect and prognosis | What are the criteria for the cured state? | 33 |
| | It is not known if the disease can be cured | |
| | When medication or treatment does not improve the pain | |
| Difficulty in diagnosis | When objective and subjective information do not match | 22 |
| | When the chief complaint is ambiguous | |
| Difficulty in the decision about whether to do occlusal adjustment | Even though it is suspected that occlusion may be the cause, it is difficult to decide whether proactive treatment such as adjusting dental occlusion or adjusting a defective prosthesis should be performed. The dentist hesitates to decide when the treatment may not cure the problem | 16 |
| | Difficult to judge whether to observe the disease course or treat actively | |
| Difficulty in specifying a cause | There are a variety of causative factors, such as occlusion, parafunction, life background, and habit | 13 |
| | Causes are not clear | |
| Difficulty in communicating with patients and mental factors | When the patient have psychosomatic problems and unidentified complaints | 12 |
| | When the patient is not cooperative in treatment | |
| | Some patients cannot understand explanations delivered over time in lay terms. It is difficult to treat patients who cannot understand | |
| Health insurance system barriers | We want to spend more time on the problem, but the health insurance system does not reimburse for this cost. Therefore, to what extent we should listen to the complaint is a problem | 1 |
performed as initial treatment, as many as 64% of US and 58% of Japanese dentists initially use occlusal adjustment in their practice. This apparent evidence-practice gap in occlusal practice also warrants mention. The subjects were not a random selection, but instead were responders to a recruitment request in the JDPBRN. Nevertheless, the subjects represented a reasonably diverse range of dental care from the 7 major geographical areas of Japan. Distributions by age and sex were consistent with the distribution of Japanese dentists, namely 80% men with an average age in the 40s. These characteristics support the generalizability of our results. Other limitations exist regarding unmeasured variables, such as the seniority of dentists or their psychological factors like personal distress tolerance and influence the dentist distress on the management of chronic pain.

The main strength of this study is its use of mixed methods (qualitative and quantitative analysis). Qualitative analysis is suitable for exploratory clarification of this phenomenon. Also, this study clarified factors associated with the themes revealed by quantitative analysis. A limitation of this study regarding selection bias also warrants mention. The subjects were not a random selection, but instead were responders to a recruitment request in the JDPBRN. Nevertheless, the subjects represented a reasonably diverse range of dental care from the 7 major geographical areas of Japan. Distributions by age and sex were consistent with the distribution of Japanese dentists, namely 80% men with an average age in the 40s. These characteristics support the generalizability of our results. Other limitations exist regarding unmeasured variables, such as the seniority of dentists or their psychological factors like personal distress tolerance and influence the dentist distress on the management of chronic pain.
5. Conclusion
Against the controversial background of an evidence-practice gap in the treatment of patients with TMD, we identified 6 themes of dentists’ distress in the management of chronic pain control of TMD. The percentage of patients in their practice who experienced difficult symptoms was associated with higher dentists’ distress in decision making for occlusal treatment. Further, dentist awareness of the existence of TMD clinical practice guidelines may lower dentist distress, particularly with regard to prognosis. Further studies to lower dentist distress and to fill the evidence-practice gap in TMD treatment are needed.

References
[1] Velly AM, Schiffman EL, Rindal DB, et al. The feasibility of a clinical trial of pain related to temporomandibular muscle and joint disorders: the results of a survey from the Collaboration on Networked Dental and Oral Research dental practice-based research networks. J Am Dent Assoc 2013;144:1-0.
[2] Ministry of Health, Labour and Welfare. Survey of Dental Diseases. Available from: http://www.mhlw.go.jp/poutouke/list/dl/62-17c23-1.pdf. Accessed January 8, 2017.
[3] Greene CS, Mohl ND, McNell C, et al. Temporomandibular disorders and science: a response to the critics. Am J Orthod Dentofacial Orthop 1999;116:430-1.
[4] Goldstein BH. The TMD controversies continue. J Can Dent Assoc 1999;65:47-8.
[5] Shulman J. TMD controversy continues. J Calif Dent Assoc 2015;43:702.
[6] Jenkins DN. TMD: the great controversy. J Calif Dent Assoc 2014;42:518–20.
[7] Kakudate N, Yokoyama Y, Sumida F, et al. Dentist practice patterns and therapeutic confidence in the treatment of pain related to temporomandibular disorders in a dental practice-based research network. J Oral Facial Pain Headache 2017;31:152-8.
[8] Yuasa H, Kino K, Kubota E, et al. Primary treatment of temporomandibular disorders: the Japanese Society for the temporomandibular joint evidence-based clinical practice guidelines, 2nd edition. Jpn Dent Sci Rev 2013;49:89-98.
[9] Durham J, Exley C, John MT, et al. Persistent dentoalveolar pain: the patient’s experience. J Orofac Pain 2013;27:6-13.
[10] Durham J, Steele JG, Wassell RW, et al. Living with uncertainty: temporomandibular disorders. J Dent Res 2010;89:827–30.
[11] Wolf E, Birgerstam P, Nilner M, et al. Nonspecific chronic orofacial pain: studying patient experiences and perspectives with a qualitative approach. J Orofac Pain 2008;22:349-58.
[12] Peters S, Goldthorpe J, McEtvoy C, et al. Managing chronic orofacial pain: a qualitative study of patients’, doctors’, and dentists’ experiences. Br J Health Psychol 2015;20:777-91.
[13] Lindfors E, Tegelberg Å, Magnusson T, et al. Treatment of temporomandibular disorders—knowledge, attitudes and clinical experience among general practising dentists in Sweden. Acta Odontol Scand 2016;74:460–5.
[14] Slade SC, Kent P, Patel S, et al. Barriers to primary care clinician adherence to clinical guidelines for the management of low back pain: a systematic review and metasynthesis of qualitative studies. Clin J Pain 2016;32:800–16.
[15] Creswell JW. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th ed. Thousand Oaks: SAGE Publications; 2013.
[16] Gilbert GH, Williams OD, Rindal DB, et al. The creation and development of the Dental Practice-Based Research Network. J Am Dent Assoc 2008;139:74–81.
[17] Braun V, Clarke V. What can “thematic analysis” offer health and wellbeing researchers? Int J Qual Stud Heal 2014;9:26132.
[18] Clarke V, Braun V. Teaching thematic analysis. Psychologist 2013;26:120–3.
[19] Zakrzewska JM. Multi-dimensionality of chronic pain of the oral cavity and face. J Headache Pain 2013;14:37.
[20] Kakudate N, Sumida F, Matsumoto Y, et al. Restorative treatment thresholds for proximal caries in dental PBRN. J Dent Res 2012;91:1202–8.
[21] Kakudate N, Sumida F, Matsumoto Y, et al. Dentists’ decisions to conduct caries risk assessment in a Dental Practice-Based Research Network. Community Dent Oral Epidemiol 2015;43:128–34.
[22] Yokoyama Y, Kakudate N, Sumida F, et al. Dentists’ dietary perception and practice patterns in a dental practice-based research network. PLoS ONE 2013;8:e59615.
[23] Yokoyama Y, Kakudate N, Sumida F, et al. Evidence-practice gap for in-office fluoride application in a dental practice-based research network. J Public Health Dent 2016;76:91–7.
[24] Yokoyama Y, Kakudate N, Sumida F, et al. Evidence-practice gap for dental sealant application: results from a dental practice-based research network in Japan. Int Dent J 2016;66:330–6.
[25] Gordan VV, Bader JD, Garvan CW, et al. Restorative treatment thresholds for occlusal primary caries among dentists in the dental practice-based research network. J Am Dent Assoc 2010;141:71–84.
[26] Riley JL III, Gordan VV, Ajmo CT, et al. Dentists’ use of caries risk assessment and individualized caries prevention for their adult patients: findings from The Dental Practice-Based Research Network. Community Dent Oral Epidemiol 2011;39:564–73.
[27] Watanabe EK, Yatani H, Kuboki T, et al. The relationship between signs and symptoms of temporomandibular disorders and bilateral occlusal contact patterns during lateral excursions. J Oral Rehabil 1998;25:409–15.
[28] Just JK, Perry JHT, Greene CS. Treating TM disorders: a survey on diagnosis, etiology and management. J Am Dent Assoc 1999;122:55–60.
[29] Glaros AG, Glass EG, McLaughlin L. Knowledge and beliefs of dentists regarding temporomandibular disorders and chronic pain. J Orofac Pain 1994;8:216–22.
[30] Lee WY, Choi JW, Lee JW. A study of dentists’ knowledge and beliefs regarding temporomandibular disorders in Korea. Cranio 2000;18:142–6.
[31] Baharvand M, Sedaghat Monfaried M, Hamian M, et al. Temporomandibular disorders: knowledge, attitude and practice among dentists in Tehran, Iran. J Dent Res Dent Clin Dent Prospects 2010;4:90–4.
[32] Le Resche L, Truelove EL, Dworkin SF. Temporomandibular disorders: a survey of dentists’ knowledge and beliefs. J Am Dent Assoc 1993;124:90–4.
[33] Ministry of Health Labour and Welfare. Survey of Physicians, Dentists and Pharmacists: Trends in the number of dentists, 2010. Available from: http://www.mhlw.go.jp/poutouke/list/dl/62-17c23-1.pdf. Accessed January 8, 2017.