

Tooth Contact Versus Clenching: Oral Parafunctions and Facial Pain

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***Aims:** To test the hypothesis that estimates of time spent in tooth contact are significantly greater than estimates of time spent clenching, and to test the hypothesis that tooth contact is greater in pain patients, particularly those reporting facial or head pain, than those with pain elsewhere in the body. **Methods:** An anonymous, voluntary, confidential questionnaire was administered to 235 patients seeking care at a general medical clinic. The questionnaire assessed demographic variables, presence and location of pain, and percentage of time spent in tooth contact and in clenching. Analysis of variance was used to examine differences among groups of patients; logistic regression was used to identify significant predictors of pain. **Results:** All patients reported that the percentage of time spent in tooth contact was significantly greater than the time spent clenching. The same pattern of results emerged for those with and without head pain, and those with and without any chronic pain problem. Both tooth contact and clenching were significantly associated with head pain. **Conclusion:** Results from the logistic regressions provide convergent validity on the importance of oral parafunctions, specifically tooth contact and clenching, to facial/head pain. For assessment of oral parafunctional behaviors, inquiries that utilize clear behavioral referents (tooth contact versus clenching) are likely to result in more accurate estimates than behaviors with unclear definitions.*

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The role of clenching and other oral parafunctional behaviors in temporomandibular disorders (TMD) is controversial. Some studies, many using retrospective self-report via questionnaires, show a relationship between oral parafunctions and TMD pain,^{1–4} whereas others do not.^{5,6}

One potential reason for the lack of consistency in results may be due to the operational definitions used by different investigators. In some cases, oral parafunctions mean virtually any parafunctional activity occurring at any time of the day, and include clenching or grinding behaviors occurring during the day or at night. Others make distinctions between behaviors occurring during the day (eg, “diurnal bruxism”) and those occurring at night,⁷ whereas others distinguish between clenching and grinding behaviors.⁸

The actual terminology for describing and reporting oral parafunctional behaviors may be imprecise as well. Studies suggest the definition of clenching may not have the same meaning across a set of individuals, although it may be more consistent within individuals. For example, one study showed the electromyographic (EMG) correlates of “clenching” were more variable within individuals than the EMG correlates of lightly touching the teeth together or

creating maximal force between the teeth.⁹ Another study reported that EMG activity during tasks can differ across individuals, while within-subject reliability tended to be quite good.¹⁰ The variability in definitions is increased in clinical situations. When clinicians talk to patients about clenching, a second source of ambiguity, viz, the clinician's own definition, can cloud effective communication and mutual understanding of the problem.¹¹

The authors have attempted to deal with this lack of shared definition issue by focusing on actions that have clearer behavioral referents. "Tooth contact" was selected as a major dependent variable. Tooth contact increases the activity of the temporalis and masseter muscles by about 2.0 to 3.5 times the level recorded during a relaxed baseline.^{12,13} When experience sampling methods (ESM) are used to collect data about tooth contact, individuals without pain report tooth contact occurring between 30% to 45% of the day. In contrast, those with painful TMD or headaches report significantly higher values still.^{14,15} Values for both populations are orders of magnitude higher than those suggested by standard dental texts.¹⁶

Clinical observations suggest that within the same individual, the percentage of time reported for tooth contact during the day is considerably higher than the percentage reported for clenching. However, these clinical observations were obtained on patients attending a facial pain center located in a dental school. It is likely that patients providing these estimates are preconditioned or biased due to previous contacts with providers, their beliefs and knowledge about facial pain, and/or subtle cues from the diagnostician. A better estimate of the difference in proportion of time spent in clenching and tooth contact would be obtained from a more diverse patient sample responding to an anonymous questionnaire.

This study reports the results of a questionnaire administered anonymously and completed by a diverse sample of medical patients. The aim was to test the hypotheses that estimates of time spent in tooth contact are significantly greater than estimates of time spent clenching, and that tooth contact is greater in pain patients, particularly those reporting facial or head pain, than those with pain elsewhere in the body.

Materials and Methods

A computer-readable questionnaire containing 15 items was prepared using Teleform software (Cardiff). The questionnaire elicited demographic

data including age in years, sex, and race/ethnic background. The presence of chronic pain and its location were scored dichotomously using eight items. Additionally, participants self-reported the estimated percentage of time during the day that clenching occurred and the percentage that tooth contact occurred. The questions read: "What percentage of the day do you clench your teeth?" and "What percentage of the day are your teeth touching?" Participants were given no definitions for either "clenching" or "tooth contact." Additional items assessed minutes of vigorous exercise per day and interest in participating in health-promotion programs.

The project and questionnaire were approved by an Institutional Review Board. The questionnaire was voluntary, confidential, and anonymous. Each questionnaire contained a sequence number to link the physical response sheet to values written to a database. The questionnaire contained no data that could link the respondent to his or her medical record.

Participants were recruited from patients arriving for their appointments in a nonspecialty, general medical clinic located in a hospital-based medical center in Kansas City, Missouri. Participants were asked by office receptionists if they would be willing to complete the questionnaire while they waited for their appointment. All subjects were informed by receptionists that their participation was voluntary and that their decision to participate or not would have no impact on their care. Because the questionnaire was confidential and anonymous, a formal, written, informed consent form was not required. When the questionnaire was filled out, it was placed with other completed questionnaires inside a manila folder.

Completed questionnaires were scanned, read, interpreted, and verified by Teleform modules. The data were exported in an SPSS data file (version 18, SPSS) for analysis and checked again for accuracy. Within-subject differences between tooth contact and clenching estimates were evaluated using repeated measures ANOVA. Logistic regression was used to identify predictors of head pain and chronic pain elsewhere in the body.

Results

Two hundred fifty individuals were given an opportunity to participate in this cross-sectional study, and 235 individuals completed the survey. The mean age of respondents was 45.6 years (SD = 17.1), with a range of 18 to 89 years. Fifty-five percent were women. Seventy-nine percent of

Table 1 Pain Location and Frequency in All Participants Reporting Any Site of Chronic Pain and for Those Reporting Head Pain

Pain location	All % (n)	Head pain % (n)
Head	6.8% (16)	–
Neck	21.7% (51)	87.5% (14)
Upper back	12.8% (30)	50.0% (8)
Lower back	26.0% (61)	75.0% (12)
Hips	14.0% (33)	56.3% (9)
Knees	20.9% (49)	50.0% (8)
Feet	15.7% (37)	43.8% (7)

Table 3 Logistic Regression Models Predicting Presence of Head Pain and Pain Elsewhere in the Body

	OR	95% CI	P
Head pain			
Age	1.003	0.964–1.044	.87
Sex	4.211	0.850–20.863	.08
Race	1.157	0.675–1.984	.60
Contact	1.027	1.004–1.051	.02
Other pain			
Age	1.002	0.985–1.020	.78
Sex	1.637	0.924–2.900	.09
Race	1.101	0.868–1.396	.43
Contact	1.007	0.998–1.017	.11

the total sample were white/non-Hispanic, and 16% were African-American. Thirty-nine percent of the sample reported having a chronic pain problem lasting 6 months or more. Table 1 displays the location, percentages, and frequencies associated with each potential pain site. The most frequently reported sites of chronic pain reported were the lower back, knees, and neck. Head pain was reported by 6.8% of the participants. Those reporting head pain also reported high levels of chronic pain at other sites (93.8%), with 87.5% reporting concomitant neck pain.

Preliminary analyses were conducted to assess bivariate relationships among presence of head pain and demographic variables, time clenching, tooth contact time, minutes of daily exercise, and interest in health-promotion programs. Exercise and interest in health-promotion programs were not related and subsequently not included in predictive modeling. Age, sex, and race were retained in models to control for any potential confounding effect.

Data on estimated tooth contact time and clenching time for individuals with and without head pain and for any chronic pain are displayed in Table 2.

Table 2 Percentage of Time Spent Performing Clenching or Tooth Contact Behaviors in Relation to Presence of Head Pain and Any Chronic Pain

	Clench		Contact	
	Mean	SD	Mean	SD
Head pain				
Yes	40.8	32.8	64.9	29.7
No	17.2	24.8	40.0	31.4
Any chronic pain				
Yes	31.3	30.9	47.6	29.9
No	9.6	16.0	36.9	32.4

Within the total sample, the mean percentage of time reported for clenching (18.5%, SD = 25.7) was significantly less than for tooth contact (41.3%, SD = 31.8) ($F[1, 206] = 120.0, P < .001$, partial $\eta^2 = 0.37$). Of those reporting problems with head pain (Table 2), tooth contact was reported more frequently than clenching ($F[1, 205] = 25.29, P < .001$, partial $\eta^2 = 0.11$) and the head pain group reported higher levels of these behaviors than those without head pain ($F[1, 205] = 10.50, P = .001$, partial $\eta^2 = 0.05$). When subjects reporting any chronic pain were compared to those without chronic pain, significant effects were seen for clench/contact behaviors ($F[1, 188] = 91.95, P < .001$, partial $\eta^2 = 0.33$), group ($F[1, 188] = 22.33, P < .001$, partial $\eta^2 = 0.11$), and the interaction of clench/contact behaviors and group ($F[1, 188] = 5.85, P = .017$, partial $\eta^2 = 0.03$). Controlling for the effects of age and sex via analyses of covariance did not alter these patterns of results.

Logistic regression models were used to predict reports of head pain and pain elsewhere in the body. Age, sex, and race/ethnicity were selected as predictors. Because self-reported contact and clenching tapped the same domain of interest, each was entered separately into the model. As shown in Table 3, tooth contact was a significant predictor of head pain but not a significant predictor of other pain. None of the other predictors was significantly associated with pain. When clenching was entered in place of contact, the same pattern of results emerged for head pain (odds ratio [OR] = 1.024, $P < .001$, 95% confidence interval [CI] = 1.004–1.044); clenching was also a significantly associated with other pain (OR = 1.03, $P < .001$, 95% CI = 1.02–1.05).

Discussion

As expected, this sample of general medical patients reported a significantly higher percentage of time

engaging in tooth contact than clenching. Those differences were present in patients with and without head pain and those with and without chronic pain. As expected, 15 of 16 reporting head pain (93.8%) also reported at least one other site of chronic pain.

The values reported by these patients are similar to those reported previously.^{14,15} In the current study, the means and standard deviations reported for tooth contact for head pain and non-head pain participants were within the ranges reported in the earlier studies for those with and without the myofascial pain of TMD. These data suggest that self-reported tooth contact can provide valid data, comparable to that provided by ESM techniques, at least for studies involving groups of individuals.

In the earlier studies, the percentage of time in tooth contact for those with TMD or with head pain was about 1.6 times larger than for those not reporting pain. In this study, the percentage of time in tooth contact among those with head pain was of the same magnitude (1.6 times larger) than for those not reporting head pain. These findings show a consistent difference in tooth contact between those with and without facial/head pain. Whether these differences would be equally consistent for individuals with and without other pain problems is currently unknown.

Results from logistic regression provide convergent validity on the importance of oral parafunctions, specifically tooth contact and clenching, to facial/head pain. These findings are consistent with experimental and observational studies showing links among TMD,¹⁴ oral parafunctions, and facial/head pain.^{17–22} At the same time, the results also suggest that high levels of oral parafunctional activity can be associated with pain elsewhere in the body, perhaps as a response to the presence of severe pain. Unfortunately, the design of the current study did not allow this possibility to be addressed, since the questionnaire asked only about the presence of pain, not its intensity.

Collectively, the findings suggest that whether or not a patient reports a facial/head pain problem, the value that a patient reports for tooth contact will be considerably greater than the value reported for clenching. These results may reflect the meanings assigned to “tooth contact” and “clenching” by English-speaking adults. It is not known whether these results would hold in individuals whose native language is not English. Whether the values reported by patients via interview (and questionnaire) will be appropriately reliable and valid is not well-known, although initial reports are encouraging.²³ However, the consistency of results with data reported by the

considerably more complex and time-intensive ESM technique provides compelling evidence. Clinicians who inquire about activities with clear behavioral referents (ie, tooth contact versus clenching) may obtain more valuable information from their patients that could lead to better, more powerful interventions for those with facial and head pain.

Both tooth contact and clenching are proxies for activation of the masticatory muscles. More frequent and more intense activation of these muscles may lead to overuse, with concomitant development of localized inflammation, nociceptor sensitization, and eventually central sensitization.²⁴ These data provide some evidence that behavioral interventions to reduce oral parafunctions should be effective in reducing facial pain. The available evidence on this point is encouraging,²⁵ with at least one paper suggesting there is a dose-response relationship between the reduction of parafunctional activity and the degree of relief from pain.²⁶ Unfortunately, the sample sizes in these studies are small. Larger-scale, well-controlled randomized clinical trials are needed to better evaluate the effectiveness of behavioral interventions for the management of facial pain.

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