What Hurts During Dental Hygiene Treatment

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Introduction and Review of Literature

Is dental hygiene treatment painful? Although we might like the answer to be "no," there are clinical and empirical indications that many oral health care procedures are unpleasant and some are painful. Anecdotal clinical reports suggest that, for some clients, dental hygiene treatment may be a physically painful and/or psychologically distressing experience. The dental literature suggests that pain and anxious expectations about pain may be the primary reasons why some people avoid dental treatment. For example, in a 1988 survey of dental health in the United Kingdom, nearly 25 percent of adults indicated they would prefer to suffer through their dental problems and take pain-killers instead of going to the dentist for treatment. More recent research illustrates a similar point. For example, Johansson, et al., listed 15 negative dental beliefs from patients who attended an emergency dental clinic, with number eight being that patients didn’t believe the dentist would stop if they experienced pain during procedures.

If we accept the premise that thoughts and feelings are a contributing factor in dental pain—as they are in other parts of the body—then anxiousness must be considered an important component of the non-sensory aspects of dental pain. In a study of 65 college students and dental patients, Gross showed that pain sensitivity—and a measure of anxiety regarding pain—significantly correlated with drill pain (r = .47) and injection pain (r = .30). Further, research has demonstrated a clear and positive association between increased levels of dental anxiety and reports of dental pain.

As mentioned, a frequently used coping strategy of dental patients

Abstract

Purpose. The purpose of this study was to examine clients' pain reports for routine clinical procedures during dental hygiene treatment, and to examine the degree to which physical and psychological variables contribute to pain.

Methods. A convenience sample consisting of 53 (18 male, 35 female) undergraduate students enrolled at Dalhousie University participated as dental hygiene clients. Before treatment, the demographics, dental anxiety, and pain catastrophizing of students were measured. During procedures, dental status was measured. Following procedures, the amount of pain associated with procedures was recorded. Data was analyzed using an SPSS/PC statistical package.

Results. Most procedures were associated with little or no pain. However, probing and scaling were associated with greater pain. Furthermore, 25 percent of the sample reported their pain was ≥7/10 on at least one dental hygiene procedure. Dental status measures and treatment difficulty did not correlate with pain. Individuals higher in dental anxiety and pain catastrophizing reported greater pain. Multiple regression showed that all predictor variables combined to account for approximately 1/3 of the variance in pain reports.

Conclusion. On average, clinical dental hygiene treatment is associated with low levels of pain, but approximately 25 percent of subjects experienced at least one of the seven procedures as being moderately to severely painful. Findings illustrate the need for effective pain management that may be physiologically or psychologically based. Interventions geared toward reducing anxiety and pain catastrophizing may be useful additions to the curriculum of dental hygiene programs.

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is to avoid or escape the situation or, as suggested by Klepac, simply choose to not go to a dentist. Although some dental patients successfully use coping strategies, such as distraction, relaxation, or imagery to endure the acute stress of dental visits, catastrophizing and other maladaptive coping responses do exist. Recent research has shown that individuals who engage in catastrophic thinking (i.e., exaggerated or pessimistic thoughts about painful experiences) during dental hygiene treatment experience greater pain than non-catastrophizers.

In dental hygiene treatment, several procedures may be particularly likely to cause discomfort or pain for clients because of contact made with the gingiva, for example, subgingival scaling. When scaling in areas with deep pockets where the base of the pocket is difficult to reach, tissue distension may be unavoidable and may lead to significant pain unless anesthetic is administered. In fact, Grant, et al., report that root-surface debridement in sonic scaling may be associated with pain reports as high as 8 out of a possible 10, using a visual analogue pain scale. Although there is no direct empirical support, anecdotal clinic reports indicate that probing to assess attachment loss because of contact with the dentogingival junction is painful, as is flossing if the floss strikes the gingiva when forced between tight contacts.

Examining pain during dental hygiene treatment is important because individuals who experience pain may be more likely to avoid subsequent treatment. It is surprising that little research has been conducted on the nature and degree of pain experienced during dental hygiene treatment. Data on what hurts can help the dental hygienist modify clinical procedures and possibly reduce pain for clients. Additionally, such data may highlight where pharmacological or psychological interventions for pain reduction are warranted.

A primary purpose of this study was to determine the extent of pain, as rated by subjects undergoing seven traditional dental hygiene treatment procedures. Due to evidence suggesting the strong role of anxiety and catastrophizing in dental pain, another goal was to examine the degree to which psychological factors contribute to pain during dental hygiene treatment.

Methods and Materials

Participants: A convenience sample of 53 (18 men, 35 women) undergraduate students at Dalhousie University volunteered to participate as dental hygiene clients. All received course credit and free dental hygiene treatment. The mean age of the sample was 21 (SD=4.32). Clients were considered for participation only if they had not received any dental treatment for at least six months prior.

Numeric Pain Rating Scale (NPRS): The authors developed a scale to rate the intensity of pain experienced during various procedures of a traditional dental hygiene appointment. This scale was developed using scale-construction strategies for NPRS (see Turk & Melzack for a comprehensive examination of pain assessment measures and their application). Participants rated the degree of pain experienced during seven dental hygiene procedures, including: 1) head-and-neck exam, 2) hard-tissue examination, 3) probing, 4) scaling with hand instruments, 5) scaling with a sonic/ultrasonic scaler, 6) polishing, and 7) flossing. An 11-point scale was used, with the endpoints “0” (no pain at all) and “10” (extreme pain). The validity of NPRS is well documented, and demonstrates positive and significant correlations with other measures of pain intensity, as well as sensitivity to psychosocial treatments that are expected to change the impact of pain intensity during oral health care situations. The data obtained from such a scale are considered ratio in nature.

Dental Anxiety Scale-Revised (DAS-R): The DAS-R (check-up version) assesses the degree to which clients experience fear or anxiety in response to imagining different aspects of dental procedures. Participants responded to questions, such as, “If you had to go to the dentist tomorrow for a check-up, how would you feel about it,” and “When you are waiting in the dentist’s office for your turn in the chair, how do you feel?” Client responses were totaled, with higher values reflecting more intense dental anxiety. The DAS-R is quick and easy to administer, and has been shown to be valid and internally consistent.

Tests of construct validity show the DAS-R check-up version positively correlated with a history of dental problems (r=0.13; p=0.001), negatively with frequency of dental visits (r=-0.28; p<0.001), and positively with other measures of dental anxiety (r=0.61; p=0.05).

Pain Catastrophizing Scale (PCS): The PCS is a self-reported measure of pain-related catastrophic thinking that consists of 13 items describing the thoughts and feelings that individuals may experience when in pain. Participants reflected on past painful experiences, and indicated the degree to which they experienced each thought or feeling. Ratings were made on a 5-point scale with end points (0) “not at all” and (4) “all the time.” Examples of the items responded to were, “I worry all the time about whether the pain will end,” “I feel I can’t go on,” and “I wonder whether something serious may happen.” The PCS had high internal consistency (coefficient alpha=0.87) and predictive validity of pain and distress scores in a dental hygiene population.
Dental Status: Dental status was assessed by three separate indices: plaque index, periodontal status (or case type), and degree of scaling difficulty. Each dental status was measured by a senior dental hygiene student and is verified or adjusted by faculty. The criteria for each measurement was based upon practice standards outlined in a criterion-related system employed by the Dalhousie University School of Dental Hygiene. These criteria were based strictly on clinical practice standards developed by the Canadian Dental Hygienists' Association (CDHA).

Plaque Index: A red dye was applied to the teeth surface. For people with full dentition, ratings were made on six specific teeth. For each tooth considered, plaque ratings ranged from “0” (no plaque) to “3” (plaque covers the exposed tooth surface); total plaque index ranged from 0 to 18.

Case Type: Case type was based on an assessment of probing depths, points of bleeding, and tissue characteristics (i.e., contour, texture, color, consistency). The dental hygienist provided a 5-point rating: 0 to 1 for healthy periodontium, 3 to 4 for gingivitis or early periodontitis, and 4 to 5 for advanced periodontitis.

Degree of Scaling Difficulty: A 4-point severity scale was used by the students to indicate the location and distribution of hard and soft deposits on the teeth. Scores ranged from one (teeth with minimal supragingival plaque and calculus), to four (heavy supragingival plaque and calculus, and generalized tenacious subgingival plaque and staining). Clients with scores approaching four required more scaling (e.g., localized to generalized root planing) than those clients with lower scores.

Procedure: Participants with no dental hygiene treatment in the previous six months met with students. They were told that the purpose of the study was to examine the thoughts and feelings that people experience during dental hygiene treatment, and that this project had received full approval from the research and ethics committee of Dalhousie University. All participants signed a consent form by their dental hygienist, which acknowledged they were aware of participating in a research investigation, they were assured their right of privacy, and they could withdraw at any time. Questions or comments were addressed at this time.

In order to complete the study, two appointments were scheduled for participants. Forty senior dental hygiene students provided routine dental hygiene treatment. Dental hygiene faculty verified all procedures and clinical assessment data. Prior to beginning treatment at the first appointment, participants completed measures of demographics, dental anxiety, and pain catastrophizing. A standard assessment protocol was then conducted: medical history was taken, vital signs were recorded, an intra- and extra-oral exam was performed, a hard- and soft-tissue exam was performed, patient education was administered, and a dental hygiene treatment plan was designed. Pain levels were then assessed for head-and-neck and hard-tissue examinations. The second appointment implemented the dental hygiene plan (i.e., flossing, scaling, polishing, and/or fluoride application). Data on level of pain experienced during procedures was collected and any questions or concerns were answered by the dental hygiene student. All participants were asked if they would like to receive a copy of this research when published. This study was conducted from November 1996 to April of 1997.

Results

Sample Characteristics: The mean rating of case type was 2.02 (SD=.25), indicating that the typical participant was classified as having gingivitis with no radiographic evidence of bone loss from periodontal disease (Table I). The mean rating of scaling difficulty was 1.86 (SD=.45). The mean plaque index was 5.19 (SD=2.53). The mean score on the DAS-R was 8.38 (SD=2.96), which is con-

| Table 1. Sample characteristics of patients and pain ratings |
|-----------------|---------------|----------------|---------------|---------------|
|                | Age           | Plaque Index   | Treatment Difficulty | Case Type | Dental Anxiety (DAS-R) | Pain Catastrophizing (PCS) |
| Mean           | 21.22         | 5.19           | 1.86               | 2.02        | 8.38                  | 16.23                     |
| Minimum        | 19            | 1              | 1                  | 1           | 4                      | 0                          |
| Maximum        | 39            | 10             | 3                  | 3           | 19                     | 33                         |
| Standard Deviation | 4.19       | 2.53           | .45                | .25          | 2.96                   | 8.29                       |

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sistent with the values reported. The mean PCS score was 16.23 (SD=8.29), which is comparable to scores previously reported in samples of undergraduate students.

Scale Reliability: In this study, the reliability coefficient for the DAS-R was .86, and the PCS was .90, which was consistent with previous reports.

Pain Ratings: The mean pain scores for each procedure are reported in Figure 1. Little or no pain was reported for procedures such as the head-and-neck exam (M=0.6, SD=.24) or polishing (M=.42, SD=.73), while slightly greater discomfort was reported for the hard-tissue exam (M=1.80, SD=1.48) and flossing (M=1.31, SD=1.53). The highest pain ratings were reported for probing (M=3.21, SD=2.32), and manual (M=3.40, SD=2.58) and ultrasonic (M=3.22, SD=3.02) scaling procedures. For a number of participants, these procedures were rated as extremely painful. Some participants rated the pain of scaling procedures as high as nine (Figure 1), in which zero represented “no pain” and 10 represented “extreme pain.” Further, 24.5 percent of the sample reported at least one procedure in which pain was greater than or equal to seven (severe to extreme).

Relations among Measures: The correlation between plaque index, treatment difficulty, case type, and pain reported for all dental hygiene procedures did not attain levels of statistical significance at the .05 level (Table II). However, dental anxiety and pain catastrophizing scores were significantly and positively correlated with participants’ pain reports for all clinical procedures, except the head-and-neck exam and ultrasonic scaling. Therefore, participants reporting higher levels of dental anxiety or pain catastrophizing were more likely to report greater pain for hard-tissue examination, probing, hand scaling, polishing, and flossing.

A series of multiple-regression equations were conducted to examine the total amount of variance in pain reports for dental hygiene procedures by the dental status and psychological variables assessed in this study. Although several significant relations emerged, the physical and psychological variables combined to account for only a modest degree of variance in participants’ pain ratings (Table II). Results of the regression analyses accounted for 41 percent of the variance of pain reported for probing, 37 percent for scaling with hand instruments, and 31 percent for flossing. While these analyses were statistically significant at the .05 level, approximately two-thirds of the variance in pain ratings was not accounted for by the physical and psychological variables assessed.

Discussion

What Hurts?: Mean pain reports showed that most clinical dental hygiene procedures, such as the head-and-neck exam, hard-tissue examination, polishing, and flossing were associated with minimal discomfort. However, pain reports for probing and scaling were associated with slightly higher levels, indicating a mild-to-moderate pain experience. Examining the distribution of pain scores, data also show that approximately 25 percent of participants experienced pain ranging from moderate to severe for at least one dental hygiene procedure. Although these participants remain in the minority, such figures indicate that one out of every four participants experienced significant pain during dental hygiene treatment.

In examining which procedures are painful, the data clearly indicated that procedures involving contact between instruments and the gingiva were the most likely to be associated with pain, whereas pro-
Table II. Pearson correlations between pain scores, dental anxiety (DAS-R), pain catastrophizing, plaque index, and case type, with total variance accounted for across pain scores.

<table>
<thead>
<tr>
<th>Clinical Procedures:</th>
<th>DAS-R</th>
<th>PCS</th>
<th>Plaque Index</th>
<th>Treatment Difficulty</th>
<th>Case Type</th>
<th>Total Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head-and-neck exam</td>
<td>.08</td>
<td>.10</td>
<td>.05</td>
<td>.16</td>
<td>-.02</td>
<td>.04</td>
</tr>
<tr>
<td>Hard-tissue examination</td>
<td>.43**</td>
<td>.36**</td>
<td>-.06</td>
<td>.07</td>
<td>-.06</td>
<td>.24</td>
</tr>
<tr>
<td>Probing</td>
<td>.38**</td>
<td>.58**</td>
<td>.19</td>
<td>.05</td>
<td>-.04</td>
<td>.41</td>
</tr>
<tr>
<td>Scaling/hand instrument</td>
<td>.38**</td>
<td>.57**</td>
<td>-.02</td>
<td>.05</td>
<td>.02</td>
<td>.37</td>
</tr>
<tr>
<td>Scaling/sonic/ultrasonic scaler</td>
<td>.06</td>
<td>.34</td>
<td>.10</td>
<td>.16</td>
<td>.14</td>
<td>.09</td>
</tr>
<tr>
<td>Polishing</td>
<td>.36</td>
<td>.40**</td>
<td>.16</td>
<td>.12</td>
<td>.17</td>
<td>.22</td>
</tr>
<tr>
<td>Flossing</td>
<td>.33*</td>
<td>.47**</td>
<td>.21</td>
<td>.12</td>
<td>.07</td>
<td>.31</td>
</tr>
</tbody>
</table>

Note: * = < .05  ** = < .01

cedures that did not involve this contact appeared to be relatively pain-free. For example, probing and scaling were associated with greater pain intensity compared to having teeth polished or a head-and-neck exam. The level of pain reported for sonic scaling (8 out of 10) seemed to confirm earlier data reported by Grant, et al. This indicates a consistency of pain extremes experienced by clients.

Although the dental hygiene students involved with the data collection in this study were all trained to specific standards of practice, the variation of quality in procedural technique and therefore, participant discomfort may be of concern. However, in the current study, it was unlikely that dental hygienist variables were responsible for the pain data collected. Among participants, pain ratings varied as expected, with more involved procedures associated with more pain. In addition, pain ratings significantly correlated with measures of catastrophizing and dental anxiety. These pain ratings varied systematically according to individual difference measures, regardless of which dental hygienist provided treatment.

Reducing Pain and Distress in Clients: Depending on a client's periodontal disease status, probing and scaling in deep pockets, which causes discomfort, may be unavoidable. As suggested by Cross-Polite, et al., taking extra care not to induce discomfort during dental hygiene treatment may not be sufficient to relieve pain, in which case aggressive pain-management techniques may be required. Under such circumstances, psychologically based pain-control interventions, such as local or topical anesthesia, or electrical stimulation may be useful.

Psychological Factors in Dental Pain: The fact that psychological variables, such as pain catastrophizing and dental anxiety, were significantly correlated with pain suggests that behavioral interventions also may be useful in reducing distress and pain during dental hygiene treatment. In particular, providing a clinical atmosphere in which clients feel free to express their concerns to the dental hygienist may be helpful, especially with the use of relaxation and self-instructional strategies. As suggested by Prowse, et al., dental hygienists should strive to create an empathic environment to augment the use of any anesthetic regimen for pain or distress. An empathic environment is one where the client feels accepted and able to freely express concerns about their treatment.

Why Didn't Dental Status Variables Predict Pain?: In this study, dental status variables, such as case type, treatment difficulty, and plaque, were not significantly associated with the pain reports for the dental hygiene procedures. This finding may not seem so surprising when the typical client in this sample is considered: a mean age of 21, a low scaling difficulty of 1.86, and a plaque index of approximately five. It may be possible that such a homogenous sample reduced the variability in this study and therefore, the effect of dental status variables.

Psychological Variables and Procedural Pain: Dental anxiety and pain catastrophizing were shown to be significantly associated with pain and probing, scaling, and flossing. These findings illustrate the impact that psychological variables can have on the pain experience. Although dental anxiety and pain catastrophizing were significantly associated with pain, multiple-regression analyses showed that all predictor variables combined to account for a minimal degree of variance in pain reports for head-and-neck exams.
hard-tissue exams, sonic/ultrasonic scaling, and polishing. The variance accounted for in probing, scaling, and flossing was greater than in other procedures, but approximately two-thirds of the variance in pain ratings remains unaccounted. These figures indicate there is more occurring in the pain experience of clients than was examined in this study.

Other factors in dental hygiene pain, such as the quality of the interpersonal relationship between the hygienist and client, also may have influenced pain reports. It is suggested that future research extend the present literature on dental hygiene pain by examining these pain-related factors during treatment.

Study Limitations

Although the current findings support the empirical and anecdotal evidence cited for pain in certain dental hygiene procedures, the method of sampling participants restricts the generalizability of these results. In particular, the sample characteristics indicate a relatively homogenous sample in regard to age, education, and dental status. Although one cannot be sure these data are reflective of a clinic-based sample—in which age, education, and dental status are more variable—the present findings do apply to a segment of the general population who are recipients of dental care. Future research is needed to see if a clinic-based population reports similar findings for pain during different clinical dental hygiene procedures, as well as the associations between pain, dental anxiety, and catastrophizing.

Conclusion

On average, clinical dental hygiene procedures are associated with low levels of pain. However, the data indicate that approximately 25 percent of the sample experienced at least one of seven clinical dental hygiene procedures as being severely to extremely painful. These findings illustrate the need for effective pain management in dental hygiene treatment, and several physiologically and psychologically based interventions may be appropriate. This study also showed that an equally important question is who hurts. Learning how to identify clients who score high on dental anxiety and pain catastrophizing will help dental hygienists individualize their care to address their special needs, which may be useful additions to the curriculum of dental hygiene education programs.

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References