Differentiation Between Musculoligamentous, Dentoalveolar, and Neurologically Based Craniofacial Pain With a Diagnostic Questionnaire

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A self-administered questionnaire consisting of 21 questions, diagrams for chief pain location, and a digital pain scale was used prospectively to sort 92 patients with orofacial pain into three categories: (1) musculoligamentous (ie, temporomandibular disorders); (2) neurologically based (ie, migraine, trigeminal neuralgia, tension-type headache, cluster headache, and atypical facial pain); and (3) dentoalveolar pain. Sensitivity, specificity, as well as negative and positive predictive values suggest that this questionnaire may be used reliably to identify patients with orofacial pain that fits the above-described pain categories without prior knowledge of the clinical diagnosis. Digital pain scale findings indicated that on presentation, pain level could not be correlated with any particular pain category, but when using this scale to describe past pain experience, patients with neurologically based pain selected the highest digital pain scale values up to six times more frequently than patients with musculoligamentous or dentoalveolar pain. Patients with musculoligamentous or dentoalveolar pain selected the lowest digital pain scale values up to 15 times more frequently than those with neurologically based pain. Although this questionnaire may be used for initial categorization of pain, there is still no substitute for a thorough history and clinical examination.
J OROFACIAL PAIN 1994; 8:357–368.

Since the true costs of chronic facial pain to society have been estimated to be several billion dollars,[1] it is essential that an accurate diagnosis be made as early as possible. In this regard, it is common for patients[2] to seek multiple opinions prior to obtaining an appropriate diagnosis. Moreover, patients must often wait lengthy periods of time for an assessment. Patients sometimes wait many months to be assessed in a temporomandibular joint (TMJ) clinic only to be told that they do not have a TMJ (or temporomandibular disorder [TMD]) problem, and instead they must be seen by the appropriate medical practitioner (eg, neurologist). Furthermore, patients seeking care from their primary care-giver may be treated inappropriately for pain conditions with overlapping symptoms. Thus, it is clear that a valid, yet easily administered and analyzed, diagnostic tool is required to circumvent some of the problems outlined above. With such an instrument, it might be possible to, in effect, rank patients immediately upon referral so that they can be assessed and treated more efficiently by the most suitable clinician.

The difficulty and frustration related to the diagnosis and subsequent treatment of patients with chronic orofacial pain may be

attributable in part to the multidimensional nature of pain. Several different facial pain conditions exist, often with overlapping signs and symptoms, and this tends to add another level of complexity to the diagnosis and management of chronic orofacial pain.[3] To characterize the syndromes of patients with pain more reliably and efficiently, various types of questionnaires have been developed.[4-6] For example, the McGill Pain Questionnaire is used widely to assess pain, but it is used rarely as a diagnostic instrument.[4] Other questionnaires, indexes, and assessment tools have been developed and utilized to differentiate among various facial pain conditions, such as TMJ pain, trigeminal neuralgia (TN), atypical facial pain (AFP), cluster headache (CH), muscle contraction headache (MCH), migraine headache (M), and others.[7-13] However, many of these instruments are quite cumbersome and hence difficult for the patient to complete and for the examiner to analyze.

To date, there are few easily administered multidimensional diagnostic tools for the assessment of chronic orofacial pain. The purpose of this study was to develop a simple, self-administered questionnaire to differentiate between three broad groups of pain in patients: *(1)* musculoligamentous pain, such as in TMD; *(2)* neurologically based pain, such as in TN, M, AFP, CH, and MCH; and *(3)* dentoalveolar pain, such as in tooth or periodontal pain. This tool was developed with the aid of a previous questionnaire[14] used in a pilot study of 117 patients. The new questionnaire consisted of 21 questions, a digital pain scale (DPS),[15] and diagrams for pain location. With this questionnaire, it may be possible to initially categorize a patient's facial pain condition, which would permit patient referral to the appropriate care-giver in a more timely manner. Furthermore, this might prevent inappropriate treatment for pain conditions with overlapping symptoms.

Materials and Methods

Study Design

The questionnaire, consisting of 21 questions, a DPS, and diagrams for pain location, was administered to 92 patients (group 1) presenting consecutively to the Craniofacial Pain Research Unit at the Mount Sinai Hospital (Toronto, Canada) with complaints of craniofacial pain. Each patient was asked to complete the self-administered questionnaire prior to undergoing his or her first clinical assessment. The history and clinical examination were conducted by one of four investigators for establishment of a clinical diagnosis. In cases involving neurologically based conditions, all diagnoses were made by one of two neurologists (AG, MS) with considerable expertise in the area of facial pain. Commonly accepted criteria, described by the International Headache Society,[16] were used for diagnosis of TN, MCH, M, and CH. The diagnosis of AFP was also confirmed by a neurologist according to criteria suggested by others.[17] Diagnoses of musculoligamentous pain or dentoalveolar pain were made by one of two dentists (DM, HCT) according to well-defined clinical criteria as described elsewhere.[18,19] The questionnaires were analyzed by another investigator (LH) who was blinded to the clinically determined diagnoses to derive an unbiased instrument-based differential diagnosis. Similarly, the clinical diagnoses were established without knowledge of the instrument-based assessment. The instrument-based diagnoses were then compared to the clinical diagnoses (gold standard) and the findings subjected to statistical evaluation.

Development of the Questionnaire

A previous questionnaire[14] had been administered to a group of 117 patients attending the pain clinic in a pilot investigation. This questionnaire consisted of 67 questions and 9 diagrams for pain location. The questions were divided into a number of categories including, but not limited to: pain intensity (0 = no pain; 1 = slight pain; 2 = quite a bit of pain; 3 = extreme pain) and pain frequency (0 = never; 1 = rarely; 2 = sometimes; 3 = most of the time or always). The answers to questions were analyzed retrospectively to identify responses that could be correlated with a particular clinical diagnosis, such as TMJ pain, myofascial (MYO) pain, combined TMJ/MYO pain, AFP, TN, M, CH, tension-type or MCH, and dentoalveolar pain, in the following manner: The answers were concatenated such that responses of 0 or 1 were considered negative, and responses of 2 or 3 were considered positive. Questions that resulted in a positive response for a particular diagnosis at least 60% of the time were designated "inclusionary" for that diagnosis. Questions that resulted in positive responses less than or equal to 10% of the time were designated as "exclusionary." On this basis it was possible to decrease the number of questions in the questionnaire to 21 (Table 1). As an internal control, two questions were repeated within the questionnaire.

Digital Pain Scale. A DPS was used for patients to express their perception of the severity of their own pain, and it consisted of two horizontal

Table 1 Diagnostic Questionnaire

No.	Question
1	My principal pain is constant without any pain free intervals.
2	My principal pain is located externally, on my skin.
3	My principal pain starts when I lightly touch that area on my face.
4	My principal pain starts or gets worse when I drink/eat hot or cold things.
5	My principal pain occurs intermittently in a non-predictable pattern, with pain-free intervals.
6	When I have my principal headache, any bright light or noise annoys me more.
7	My jaw makes a grating, grinding, popping, or clicking noise when I chew, eat or talk.
8	My principal pain is only on ONE side of my head or face and it is always on the SAME side.
9	My principal pain is at its maximum at the beginning.
10	My principal pain makes me feel sick to my stomach (nauseated).
11	My pain gets worse the more I move my jaw when eating, chewing, or talking.
12	My principal pain is sometimes on one side and sometimes on the other, at different times.
13	I hear clicking or popping from my jaw before the pain starts.
14	My principal pain comes in clusters, everyday for several days or weeks, with long pain-free intervals (weeks, months).
15	My principal pain is located externally, on my skin.
16	My principal pain is NOT constant, there are pain-free intervals between bouts of pain.
17	My principal pain is getting worse over time.
18	I feel pain when I press hard on the back of my neck.
19	My jaw pops or clicks when I open my mouth wide.
20	My principal pain is on BOTH sides of my head or face at the SAME time.
21	My jaw pain gets worse the more I move my jaw (eat hard food, talk, or chew).

Rating scale: 0 = never, none of the time; 1 = rarely; 2 = sometimes; 3 = always, most of the time. 0 or 1 = negative response; 2 or 3 = positive response.

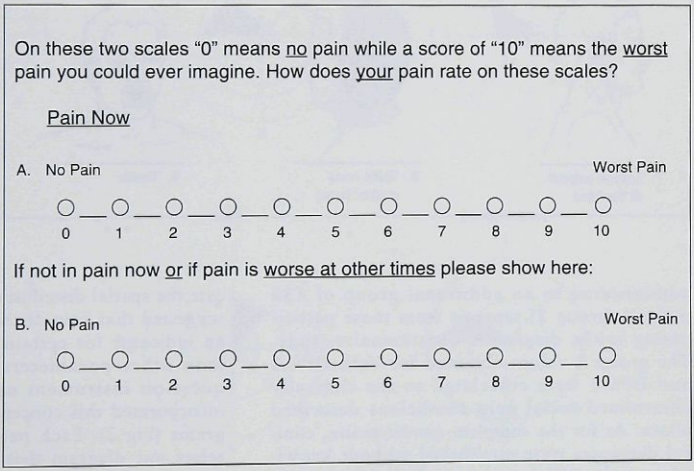

Fig 1 These scales were used for patients to express their perception of the severity of their pain. The scale ranged from 0 to 10, with 0 representing "no pain" and 10 representing the "worst pain you could ever imagine." Patients were asked to complete both DPS-A, which represented pain on presentation, and DPS-B, which represented pain at other times if more severe.

lines with graded markings 1 cm apart (Fig 1). The scale ranged from 0 to 10, with 0 representing no pain and 10 represented the "worst pain you could ever imagine." Patients were asked to complete both lines such that the top line (DPS-A) represented pain on presentation and the second line (DPS-B) represented pain at other times if more severe (ie, past pain experience). Findings from an earlier retrospective study[15] using this scale indicated that patients with AFP selected a value of "9-10" at least four times more frequently than those individuals with, for example, musculoligamentous pain ($P < .05$), but only on the DPS-B. To confirm and expand these findings, the same DPS was

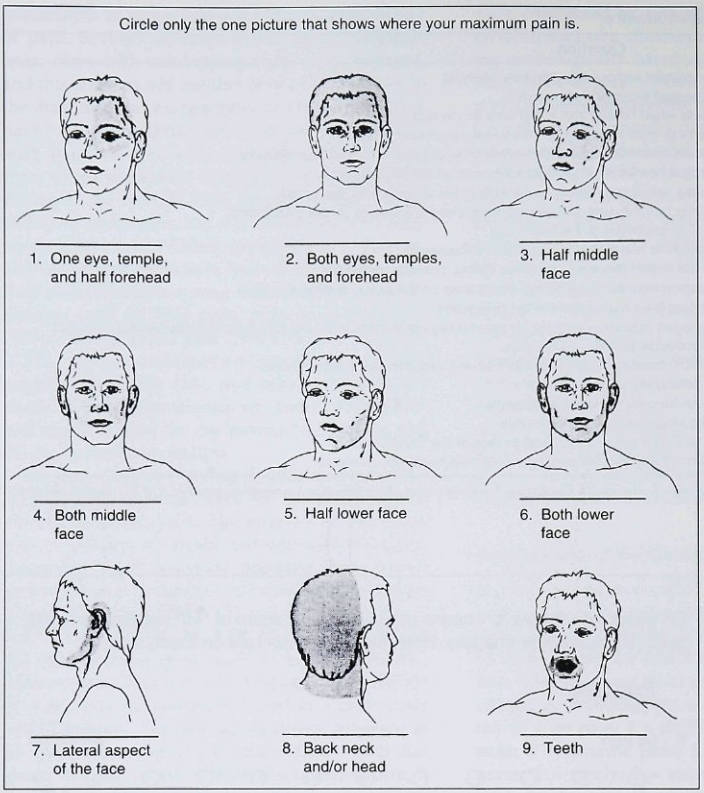

Fig 2 Patients were instructed to select one of the diagrams, which indicated the location of their principal pain.

administered to an additional group of 130 patients (group 2) separate from those participating in the diagnostic questionnaire study. The group 2 values obtained for both DPS-A and DPS-B were correlated to the clinically determined facial pain conditions described above. As for the complete questionnaire, clinical diagnoses were established without knowledge of the DPS scores and all diagnoses were established according to criteria described elsewhere.[16–19] To exploit the putative discriminative capacity of the DPS already suggested in the earlier investigation,[15] it was appended to the diagnostic questionnaire to aid the investigator in differentiating between AFP and musculoligamentous conditions.

Pain Diagrams. The McGill Pain Questionnaire utilizes pain diagrams or body maps to indicate the spatial distribution of pain.[4] It has been suggested that pain distribution may be used as an indicator for certain pain conditions more than other parameters.[18,19] The original 67-question instrument used in the pilot study incorporated this concept and contained 9 diagrams (Fig 2). Each patient was instructed to select one diagram that indicated the location of their principal pain. From these results it was possible to construct polar graphs for pain distribution (Fig 3) that were representative of the various diagnoses.

Analysis

Assessment of Diagnostic Accuracy. The instrument-based differential diagnoses were categorized into one of three groups:

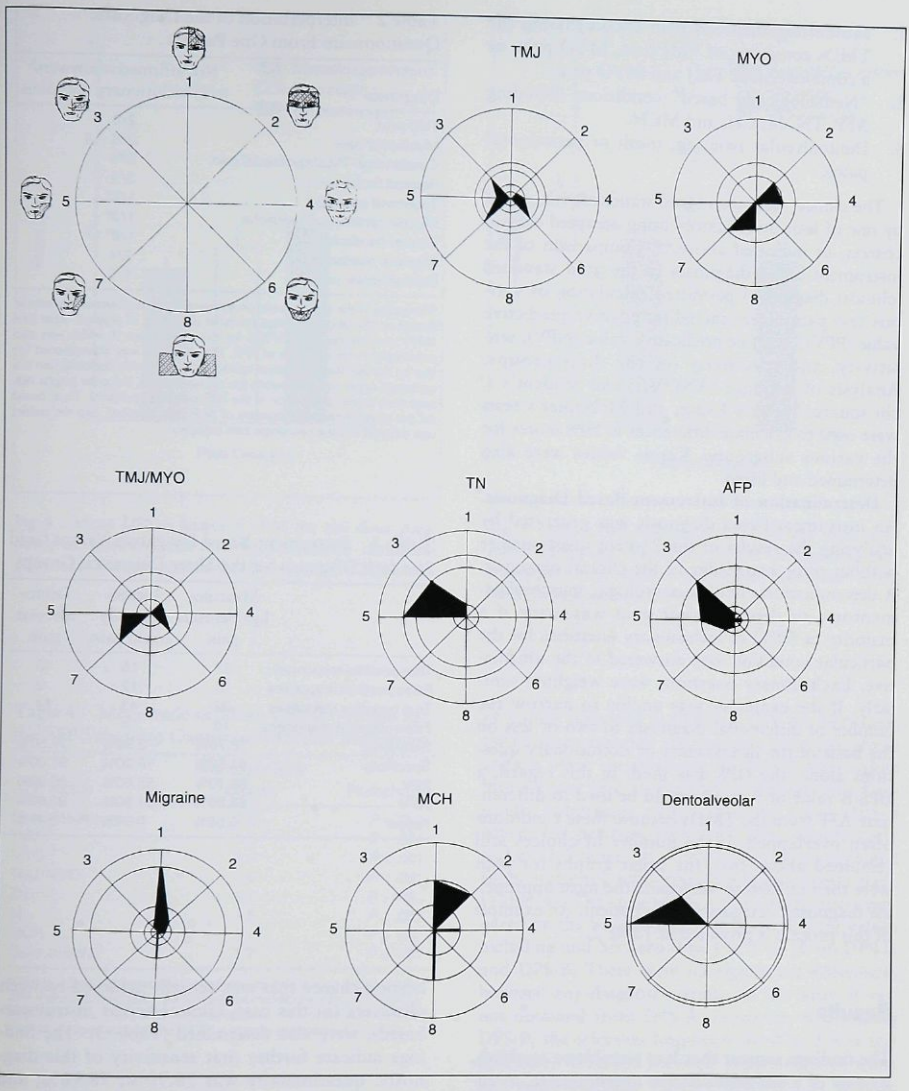

Fig 3 Pain distribution based on patient selection of diagrams in a pilot study was used to construct these polar graphs. Each graph depicts a unique pain distribution pattern for each diagnosis. The center point represents 0%, and the outer perimeter approaches 100%. In some instances, the outer perimeter is not shown. Each bin depicts a pain location diagram, and thus, the percentage of patients with a specific diagnosis was represented on the axis (perpendicular to outer perimeter) in each bin. The values on each axis were connected to one another. The resulting circumscribed area was filled (black) to generate a unique pattern or "fingerprint" for each diagnosis.

1. Musculoligamentous pain encompassing the TMDs consisting of TMJ pain, MYO pain, or a combination of TMJ and MYO pain.
2. "Neurologically based" conditions including AFP, TN, M, CH, and MCH.
3. Dentoalveolar pain (eg, tooth or periodontal pain).

The clinical diagnosis (gold standard) was made by one of four investigators using accepted clinical criteria, as indicated above.[16–19] Comparison of the instrument-based diagnoses to the gold standard (clinical diagnoses) permitted calculation of various test parameters including positive predictive value (PPV), negative predicative value (NPV), sensitivity, and specificity for the three groups. Analysis of variance (ANOVA) and Student's *t*, chi-square, Fisher's Exact, and McNemar's tests were used to calculate differences in DPS scores for the various subgroups. Kappa values were also determined and listed.

Determination of Instrument-Based Diagnosis. An instrument-based diagnosis was generated by analyzing the results of the 21-item questionnaire without prior knowledge of the clinical diagnosis. A determination of either neurologic, musculoligamentous, or dentoalveolar pain was made if a majority (> 50%) of inclusionary questions for the particular condition was answered in the affirmative. Exclusionary questions were weighted similarly. If the examiner was unable to narrow the number of differential diagnoses to two or less on the basis of the inclusionary or exclusionary questions alone, the DPS was used. In this regard, a DPS-B value of 9 to 10 would be used to differentiate AFP from the TMDs because these conditions often overlapped. If the number of choices still remained above two, the polar graphs for pain were then utilized to determine the most appropriate diagnostic category for the patient. An example of this process is provided in Table 2.

Table 2 Interpretation of the Diagnostic Questionnaire From One Patient

Diagnosis	No. affirmative answers/ total inclusionary questions
TMJ pain	2/8
Myofascial pain	2/8
Combination TMJ/myofascial pain	2/6
Atypical facial pain	3/3
Trigeminal neuralgia	1/3*
Muscle contraction headache	1/3*
Cluster headache	1/6*
Migraine headache	2/4
Dentoalveolar pain	1/3

*Eliminated at the outset based on answers to the exclusionary questions. Based on the above findings an initial diagnosis of atypical facial pain (AFP) was inferred. The DPS-B for this patient was 9, which was also considered to be indicative of AFP. This diagnosis was strengthened further by the fact that the patient had selected a diagram depicting pain in a unilateral, upper half distribution (as shown in Fig 3, the polar graphs indicate such a pain distribution in the AFP patient population). Thus, based on the questionnaire, a diagnosis of AFP was selected, and the patient was entered into the neurologic pain category.

Table 3 Instrument-Based Diagnosis Versus Gold Standard Diagnosis for the Three Diagnostic Groups

	Musculo-ligamentous pain	Neuro-logically based pain	Dento-alveolar pain
True positive responses	37	15	3
False positive responses	5	12	2
True negative responses	22	43	64
False negative responses	10	4	5
Sensitivity	78.70%	78.90%	37.50%
Specificity	81.50%	78.20%	97.00%
PPV	88.70%	55.60%	60.00%
NPV	68.80%	91.50%	92.80%
Kappa	0.58%	0.50%	0.41%

Results

The findings suggest that it is possible to establish, by way of a self-administered questionnaire, a reliable determination of the nature of a given patient's pain condition. In this regard the instrument-based assessments were compared to the gold standard (clinical assessments) as shown in Table 3 to ascertain sensitivity, specificity, PPV, and NPV for the three broad diagnostic categories: musculoligamentous, neurologic, and dentoalveolar. Kappa values, which refer to the proportion of agreement beyond chance that was actually achieved between observers (in this case, clinical versus instrument-based), were also determined (Table 3). The findings indicate further that sensitivity of this diagnostic questionnaire was 78.70%, 78.90%, and 37.50% for the musculoligamentous, neurologic, and dentoalveolar groups respectively, and specificity was 81.50%, 78.20% and 97.00% for the same three groups. The PPV and NPV for the musculoligamentous group was 88.10% and 68.80%; for the neurologic group, 55.60% and 91.50%; and for the dentoalveolar group, 60.00% and 92.80% respectively.

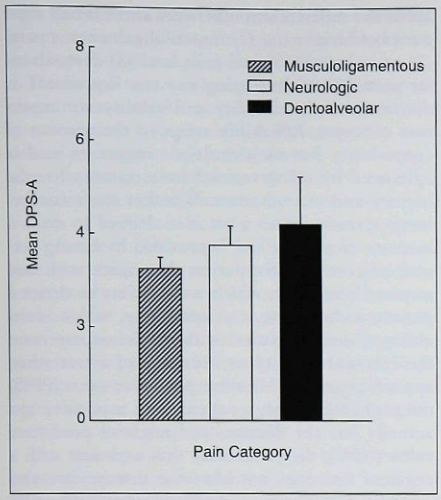

Fig 4 Mean DPS-A scores ± SEM for the three diagnostic categories. There were no statistically significant differences between any of the categories ($P > .05$).

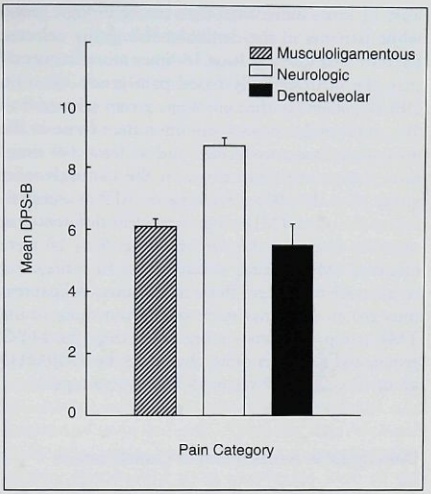

Fig 5 Mean DPS-B scores ± SEM for the three diagnostic categories. The mean DPS-B for neurologically based pain was significantly higher than either of the other two categories ($P < .001$).

Table 4 Magnitude of Mean DPS-B* Values for the AFP Subgroup Compared to Other Subgroups

AFP versus	No. times AFP greater	Probability
Musculoligamentous	1.5	$P < .001$
TMJ	1.6	$P < .001$
MYO	1.3	$P < .001$
TMJ/MYO	1.6	$P < .001$
TN	1.1	$P > .05$
M	1.5	$P < .001$
MCH	1.1	$P > .05$
Dentoalveolar	1.7	$P < .001$

*DSP-B = past pain episodes if more severe than that on presentation; AFP = atypical facial pain; TMJ = temporomandibular joint pain; MYO = myofascial pain; TMJ/MYO = combined pain; TN = trigeminal neuralgia pain; M = migraine headache; MCH = muscle contraction headache.

Digital Pain Scale

Data from the 130 DPSs of group 2 patients were combined with the data from the 89 DPSs in the questionnaires of group 1 patients. The findings show that there were few discernible differences between the various diagnostic groups on the basis of values obtained for DPS-A (Fig 4). However, there were notable differences between these groups when mean scores for DPS-B were taken into account (Fig 5). Further breakdown into diagnostic subgroups shows that the mean DPS-B scores for patients with AFP were significantly higher (1.5 times) ($P < .001$) than values obtained from patients with musculoligamentous pain (Table 4). The diagnostic groups were also compared on the basis of selection frequency for values including and between 0 to 3 or 9 to 10 on DPS-A and DPS-B. There were no significant differences between any diagnostic group on the basis of values obtained from DPS-A. However, when using DPS-B, the selection frequency for 0 to 3 was significantly different between musculoligamentous and neurologically based conditions as well as between the dentoalveolar and neurologic group ($P < .01$). When selection frequency for 9 to 10 on DPS-B was analyzed, clear differences were also shown between the neurologic and musculoligamentous groups ($P < .001$), and between the neurologic and dentoalveolar group ($P < .05$). The findings showed further that patients in the musculoligamentous group selected 0 to 3 on DPS-B at

least 11 times more often than the neurologic group while patients in the dentoalveolar group selected the 0 to 3 category at least 16 times more frequently than the neurologically based pain group. Also on DPS-B, patients in the neurologic group selected 9 to 10 a total of 2.1 times more often than those in the musculoligamentous group and at least 1.9 times more frequently than those in the dentoalveolar group ($P < .05$). When focusing on AFP in comparison to the other TMD subgroups, clear differences in selection frequency for DPS-B values 9 to 10 were observed: AFP patients selected 9 to 10 ratings 3.3 times more often than those in the musculoligamentous group, 4.3 times more often than those in the TMJ group, 2.1 times more often than the MYO group, and 6.1 times more often than the TMJ/MYO group ($P < .001$ AFP versus all TMD subgroups).

Demographic Assessment of Questionnaire

The mean age for patients in the musculoligamentous group was 32.9 years (±1.8 years) and was significantly lower ($P < .05$) than the mean ages for both the neurologically based (49.9 ± 3.8 years) and the dentoalveolar groups (47.3 ± 5.7 years). There was no statistically significant difference in age between the latter two groups ($P > .05$). The male to female ratio of 1:8 was based on the proportion of females (89%) and males (11%) participating in the study. Seventy-four of the 92 questionnaires administered were completed fully and correctly. Eighteen questionnaires were completed partially or incorrectly and were thus not amenable to analysis. A comparison was made between patients who completed the questionnaire and those who did not. Neither first language spoken (eg, English) nor gender could be correlated to a patient's ability to complete the questionnaire. Alternatively, patients with a university or college degree completed the questionnaire 2.3 times more often than those individuals with only a high school education ($P < .05$). There also appeared to be a significant correlation between the patient's age and his or her ability to complete the questionnaire; individuals who did not complete the questionnaire had a mean age 55.8 ± 3.6 years (range 17 to 88 years), and those who did complete the questionnaire had a mean age of 38.6 ± 1.9 years ($P < .001$).

Discussion

The purpose of this investigation was to develop a simple self-administered questionnaire that would aid in the differentiation between three broad categories of facial pain: *(1)* musculoligamentous pain, *(2)* neurologically based pain, and *(3)* dentoalveolar pain. When developing any test instrument or diagnostic tool, reliability and validity are important concepts. Reliability refers to the amount of consistency between multiple measures and is enhanced by using trained investigators for the history and examination. Whether the measurement operation does what it is claimed to do is a measure of validity and is provided by having several sources of information that agree with one another. Sensitivity, which is the ability to detect a patient with disease, and specificity, which is the ability to detect a patient without disease, represent the external validity or accuracy of a test when applied to groups.[20] Positive predictive value (PPV), the probability that a patient with a positive test actually has the disease, and negative predictive value (NPV), the probability that a patient with a negative test does not have the disease, are also important concepts in determining reliability.[20,21] The value known as Kappa has been defined above.

On the basis of values for sensitivity, specificity, PPV, NPV, and Kappa obtained in this investigation it was possible to accept the null hypothesis that no difference existed between the instrument-based assessment and the gold standard (clinical) assessment. In comparing the gold standard diagnosis to the instrument-based diagnosis for the musculoligamentous and neurologic categories, high sensitivity (musculoligamentous 78.70%; neurologic 78.90%), and specificity values (musculoligamentous 81.50%; neurologic 78.20%) were calculated, suggesting that this questionnaire is reliable and valid. These findings can be compared to those of the TMJ scale,[22] which has been shown previously to be a reliable and valid tool for assessment of TMD and non-TM disorders.[9,22-24] Findings obtained by the use of the TMJ scale indicated that 84.2% of all patients clinically identified as having a TM disorder were correctly classified by the "Global Scale" (one of the 10 scales in the questionnaire) as TMD patients (ie, sensitivity). Using this same scale, a specificity of 80.3% was reported.[22] Clearly then, the TMJ scale has been well-validated, and it appears that the findings reported here were comparable. However, as useful as the TMJ scale is for identification of TMD and TMD subgroups, it may be somewhat cumbersome to administer because it consists of 10 scales and 97 questions. Thus, the questionnaire described in this study was simpler but may be equally reliable. With respect to dentoalveolar pain, the sensitivity of the questionnaire was low. However, the specificity was

high, as might be expected with a lower sensitivity. In any case, this finding underscores the need for a thorough history and clinical examination.

The Kappa values calculated in this investigation also underscore the potential usefulness of the questionnaire. A Kappa of > 0.60 is generally considered to suggest substantial to very good agreement between observers, while 0.40 to 0.60 reflects moderate agreement between observers. Values of < 0.40 indicate poor or chance agreement between observers.[25-27] The Kappas reported here may thus suggest only moderate agreement between observers (test versus clinician). However, it should be noted that a number of commonly used medical tests, such as electrocardiograms, possess a Kappa reliability of approximately 0.35 (chance agreement), and thus the questionnaire reported here is at least as dependable as other commonly used diagnostic tools.[28]

The visual analog scale (VAS) is considered to be an effective method of assessing pain[29,30] and has been described extensively in the literature. These scales have been utilized for quantitative assessment of pain intensity and other disease or dysfunctional parameters.[19,31-37] This study used a DPS, which is similar to the VAS but consists of fixed markings along a finite scale anchored at one end by 0 and at the other end by 10. Therefore, the values obtained with a DPS may not be quantitative with respect to actual pain intensity. The DPS may be analyzed more easily and quickly than a VAS. Nonetheless, the data obtained by the use of this scale can be correlated to specific pain categories and specific diagnoses in some cases.

Previous investigations have suggested that it may not be possible to demonstrate clear correlations between specific pain conditions and pain intensity as measured on a VAS.[31,38] However, other investigations have demonstrated some association between the level of perceived pain and a particular pain disorder.[34] In this regard, there was no correlation between DPS-A values and any specific pain diagnosis, thus agreeing with other investigations.[31,38] Alternatively and in agreement with other findings,[34-39] DPS-B values could be linked to the three different diagnostic groups and even to the diagnostic subgroups. For example, the mean DPS-B value obtained for the neurologic group was significantly higher than the musculoligamentous group. Moreover, patients in the AFP subgroup selected the 9 to 10 category at least 3 times more frequently than individuals in the musculoligamentous group as a whole, and up to at least 6 times more frequently than patients in the TMJ/MYO group. These findings are in general agreement with an earlier study in which AFP patients selected 9 to 10 at least four times more frequently than individuals with TMD.[15] Thus, although the DPS cannot be used for direct quantitation of pain, it may be used to discriminate between the pain categories discussed here and even between some of the various subdiagnoses. This may be related to pain memory as well as to the affective component of pain rather than actual levels of pain.[2,18]

Body maps or pain diagrams have previously been used in pain studies.[4,34] Many orofacial pain syndromes are characterized by pain isolated to a particular area on the face or head.[4,14,15,19,34] For example, TN is generally identified by unilateral pain predominantly in the third branch of the fifth cranial nerve. It is thus possible to demonstrate an association between various pain conditions and location of principal pain. From the data obtained in the pilot study,[14] it was possible to construct frequency distribution polar graphs for each of the defined diagnoses. The polar diagrams may provide, in essence, a "fingerprint" of pain location indicative of different orofacial pain conditions. These "fingerprints" can be utilized as an adjunct to other techniques in the diagnostic decision-making process. Moreover, the distinct patterns represented in the polar diagrams also attest to the uniqueness of the various diagnoses as well as to some of the inherent similarities. The distribution of pain in AFP patients is remarkably similar to that observed for TN. Alternatively, the different pain patterns produced for the different subsets of the TMDs may underscore the usefulness of attempting to categorize the TMDs in such a fashion for both research and treatment reasons. For example, because the patterns for MYO and TMJ/MYO were similar, the two subsets of TMD might also be more similar than different. Conversely, the patten for TMJ pain was quite different from the other TMD subgroups, suggesting perhaps that it might be a distinct entity. These suppositions are speculative but warrant further investigation.

The demographic findings obtained in this study are also of some interest. As reported previously by others, patients with TMD tend to fall into the younger age categories.[23,40,41] In the present study, patients falling into the neurologic categories tended to be older, and this has also been reported in the literature.[18] Furthermore, the study population represented here demonstrated a marked preponderance of females, which has been reported extensively in previous studies of chronic facial pain patients.[23,29,42,43] In view of these findings, it is likely that this population is very similar to most other

chronic facial pain populations, and thus, the characteristics reported for these patients may apply to others.

Analysis of demographic data pertaining to completion of the questionnaire produced some intriguing trends. Of 92 questionnaires given, 18 were not completed (19.5%). It might have been predicted that individuals for whom English was a first language would have completed the questionnaire with greater facility than those for whom English was not a first language. However, the findings showed that this was not a factor. There did seem to be a relationship between level of education and completion of the questionnaire, since those with a university education completed the questionnaire more often than those with only high school education, and this trend has been discussed previously by others.[2] A relationship between age and questionnaire completion was also demonstrated because older individuals tended to return the questionnaires unfinished. Some investigators have suggested that as an individual ages, difficulties with abstract thinking may develop. These difficulties could interfere with a patient's ability to complete a VAS, or in this case, a DPS.[40] Indeed, for the 18 incomplete questionnaires, it was the DPS that was often unfinished.

Conclusions

The questionnaire reported here might be a practical instrument for use by not only multidisciplinary pain clinics, but also for the general dental or medical practitioner. The questionnaire, and the DPS alone in some cases, can provide information that may be used to differentiate between patients suffering from musculoligamentous pain, dentoalveolar pain, or pain that is more neurologically based. This is useful from two standpoints. First, by assisting in the differentiation between some overlapping pain conditions, it will be possible to design more appropriate treatment. Second, for those individuals requiring assessment in a multidisciplinary clinic, it may be possible to direct them more efficiently to the most appropriate practitioner at the outset, thus reducing redundant or needless investigations. Nonetheless, it is essential to carry out additional studies with this questionnaire in an attempt to refine and validate it further. Although the questionnaire at this stage of development is probably valid for the chronic pain population, its potential as a screening instrument in the general population is uncertain. Finally, there is still no substitute for a thorough history and clinical examination, which must always be used to establish and confirm the diagnosis.

Acknowledgments

The authors are indebted to Violeta Tapia, who assisted in the preparation of the manuscript, and to George Tomlinson, who assisted in statistical analysis. They would also like to thank Balram Sukhu and Maria Torontali for their assistance in the preparation of graphics.

This study was supported by the Department of Dentistry, Mount Sinai Hospital, Toronto, Ontario, Canada.

References

1. Bonica JJ. Pain research therapy. Post and current status and future needs. In: NG LKY, Bonica JJ, (eds). Pain, Discomfort and Humanitarian Care. Amsterdam Elsevier. 1980:1–46.
2. Gracely RH. Measuring pain in the clinic. Anesth Prog 1990;37:88–92.
3. Burt BA, Albino JE, Carlos JP, Cohen LK, Dubner R, Gershen JA, Greene JC. Advances in epidemiological study of orofacial diseases. Adv Dent Res 1989;3:30–41.
4. Melzack R. The McGill Pain Questionnaire. Pain 1975; 1:277–299.
5. Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: Development and validation. J Rheumatol 1991;8:728–733.
6. Pilowsky I, Spence ND. Pattens of illness behavior in patients with intractable pain. J Psychosom Res 1975;19: 279–287.
7. Williams RC. Toward a set of reliable and valid measures for chronic pain assessment and outcome research. Pain 1988;35:239–252.
8. Levitt SR, Lundeen TF, McKinney MW. The TMJ scale manual. Durham: Pain Resource Center, 1987.
9. Levitt SR, Lundeen TF, McKinney MW. Initial studies of a new assessment method for temporomandibular joint disorders. J Prosthet Dent 1988;59:490–495.
10. Hunter M. The Headache Scale: A new approach to the assessment of headache pain based on pain descriptions. Pain 1983;16:361–373.
11. Jerome A, Holroyd KA, Theofanous AG, Pingel JD, Lake AE, Saper JR. Cluster headache pain versus other vascular headache pain: Differences revealed with two approaches to the McGill Pain Questionnaire. Pain 1988;34:35–42.
12. Melzack R, Terrence C, Fromm G, Amsel R. Trigeminal neuralgia and atypical facial pain: Use of the McGill Pain Questionnaire for discrimination and diagnosis. Pain 1986;27:297–302.
13. Seymour RA, Charlton JE, Phillips ME. An evaluation of dental pain using visual analogue scales and the McGill Pain Questionnaire. J Oral Maxillofac Surg 1983;41: 643–648.
14. Hernandez-Gallego J, Larrea J, Cubero A, Carillo F. Predictability of differential diagnosis of craniofacial pain through a questionnaire: Sensitivity, specificity, and discriminant analysis on migraine and tension-type headache. In: Olesen J, Schoenen J, (eds). Frontiers in Headache Research. Volume 3: Tension-type headache classification, mechanisms and treatment. New York: Raven Press, 1993:33–37.

15. Galli G, Gordon A, Shandling M, Mock D, Tenenbaum H. Diagnostic and prognostic features of atypical facial pain: A pilot study [abstract]. J Orofacial Pain 1993; 7:116.
16. Headache Classification Committee at the International Headache Society. Classification and diagnostic criteria for headache disorders, cranial neuralgia, and facial pain. Cephalgia 1988;8(suppl 7):1–97.
17. Graff-Radford SB, Solberg WK. Atypical odontalgia. J Craniomand Disord Facial Oral Pain 1992;6:260–266.
18. Bell WE. Orofacial Pains: Differential Diagnosis, ed 2. Chicago: Yearbook, 1979:260, 268, 322.
19. Bell WE. Temporomandibular disorders: Classification, Diagnosis, Management, ed 2. Chicago: Yearbook, 1979: 215–257.
20. Yerushalmy J. Statistical problems in assessing methods of medical diagnosis, with special reference to x-ray techniques. Public Health Rep 1947;62:1432–1449.
21. Griner PF, Mayewski RJ, Mushlin AI, Greenland P. Selection and interpretation of diagnostic tests and procedures. Ann Intern Med 1981;94:553–600.
22. Levitt SR, McKinney MW, Lundeen TF. The TMJ Scale: Cross-validation and reliability studies. J Craniomand Pract 1988;6:17–25.
23. Lundeen TF, Levitt SR, McKinney MW. Discriminative ability of the TMJ Scale: Age and gender differences. J Prosthet Dent 1986;56:84–92.
24. Levitt SR. The predictive value of the TMJ Scale in detecting psychological problems and non-TM disorders in patients with temporomandibular disorders. J Craniomand Pract 1990;8:225–233.
25. Williams RC. Toward a set of reliable and valid measures for chronic pain assessment and outcome research. Pain 1988;35:239–252.
26. Shrout PE, Fleiss JL. Intraclass correlations: Uses in assessing rater reliability. Psychol Bull 1979;86:420–428.
27. Dworkin SF, LeResche L, DeRouen T, VonKorff M. Assessing clinical signs of temporomandibular disorders: Reliability of clinical examiners. J Prosthet Dent 1990; 63:574–579.
28. Koran LM. The reliability of clinical methods, data and judgements (part 1). N Engl J Med 1975;293:642–646.
29. Huskisson EC. Measurement of pain. Lancet 1974; 2:1127–1131.
30. Ohnhaus EE, Adler R. Methodological problems in the measurement of pain: A comparison between the verbal rating scale and the visual analogue scale. Pain 1975;1: 374–381.
31. Seymour RA, Charlton JE, Phillips ME. An evaluation of dental pain using visual analogue scales and the McGill Pain Questionnaire. J Oral Maxillofac Surg 1983;41: 643–648.
32. Seymour RA, Simpson JM, Charlton JE, Phillips ME. An evaluation of length and end-phrase of visual analogue scales in dental pain. Pain 1985;21:177–185.
33. Carlsson AM. Assessment of chronic pain. I. Aspects of the reliability and validity of the visual analogue scale. Pain 1983;16:87–101.
34. Viitanen JV, Kautiainen H, Isomaki H. Pain intensity in patients with fibromyalgia and rheumatoid arthritis. Scand J Rheumatol 1993;22:131–135.
35. Scott J, Huskisson EC. Accuracy of subjective measurements made with or without previous scores: An important source of error in serial measurement of subjective states. Ann Rheum Dis 1979;38:558–559.
36. Scott J, Huskisson EC. Vertical and horizontal visual analogue scales. Ann Rheum Dis 1979;38:560.
37. Allen GC, St. Amand MA, Lui ACP, Johnson DH, Lindsay MP. Post arthroscopy analgesia with intraarticular bupivacaine/morphine. A randomized clinical trial. Anesthesiology 1993;79:475–480.
38. Leavitt F, Katz R, Golden H, Glickman P, Layfer L. Comparison of pain properties in fibromyalgia patients and rheumatoid arthritis patients. Arthritis Rheum 1986;6:775–781.
39. Perry F, Heller P, Levine J. Differing correlation between pain measures in syndromes with or without explicit organic pathology. Pain 1988;34:185–189.
40. Rieder CE, Martinoff JT, Wilcox SA. The prevalence of mandibular dysfunction. Part I: Sex and age distribution of related signs and symptoms. J Prosthet Dent 1983;50:81–88.
41. Gross A, Gale EN. A prevalence study of the clinical signs associated with mandibular dysfunction. J Am Dent Assoc 1983;107:932–936.
42. Agerberg G, Carlsson GE. Functional disorders of the masticatory system I. Distribution of symptoms according to age and sex as judged from investigation by questionnaire. Acta Odontol Scand 1972;30:597–613.
43. Magnusson T. Patients referred for stomatognathic treatment—A survey of 282 patients. Swed Dent J 1984;8: 193–201.

Resumen

Diferenciacion entre los dolores musculoligamentosos, dento-alveolare y con base neurologica con la ayuda de un cuestionario diagnostico

Un cuestionario auto-administrado consistiendo de 21 preguntas, diagramas para la localización del dolor principal, y una escala digital del dolor, han sido utilizados con el propósito de sortear 92 pacientes con dolores orofaciales en tres categorías: *(1)* dolores musculoligamentosos (ML) (p.ej. desórdenes temporomandibulares), *(2)* dolores con base neurológica (BN) (p.ej. migrañas, neuralgias trigeminales, cefaleas tensionales, cefaleas generalizadas, y dolores faciales atípicos), y *(3)* dolores dento-alveolares. Los valores de la sensibilidad, especificidad, asi como los valores predecibles negativos y positivos, sugieren que este cuestionario podría ser utilizado con certeza para identificar a pacientes con dolores orofaciales que cuadran en una de las tres categorías descritas arriba, sin saber el diagnostico clinico de antemano. Los resultados obtenidos con la escala digital del dolor (EDD) indicaron que el nivel del dolor en el momento de la presentación no pudo ser correlacionado con ninguna de las tres categorías de dolor en particular. Con respeto a los dolores experimentados en el pasado, los pacientes con dolor BN seleccionaron los valores más altos en la escala digital del dolor por lo menos seis veces más frecuentemente que los pacientes con dolor ML ó dolor dento-alveolar. Los pacientes con dolor ML ó dolor dento-alveolar seleccionaron los valores más bajos por lo menos 15 veces más frecuentemente que aquellos con dolor BN. Aunque este cuestionario podría ser utilizado para la categorización inicial del dolor, todavía no existe un substituto para el exámen y el diagnostico clinicos minuciosos.

Zusammenfassung

Differenzierung zwischen tendomyopathischem, dentoalveolärem und neurologisch bedingtem Kiefergesichtsschmerz mittels eines diagnostischen Fragebogen

Es wurde ein selbstausgefüllter Fragebogen verwendet, welcher aus 21 Fragen, aus einer Graphik für die Lokalisation des Hauptschmerzes und einer digitalen Schmerzskala bestand, um 92 Patienten mit Kiefergesichtsschmerzen prospektiv in 3 Kategorien einzuteilen: *(1)* tendomyopathischer Schmerz (z.B. MAP); *(2)* neurologisch bedingter Schmerz (z.B. Migräine, Trigeminusneuralgie, Spannungstyp-Kopfweh, Cluster-Kopfweh und atypische Gesichtsschmerzen); und *(3)* dentoalveolärer Schmerz. Sensitivität, Spezifizität als auch der negative und positive prädiktiver Wert legen nahe, dass dieser Fragebogen zuverlässig zur Identifikation von Patienten gemäss obiger Schmerzkategorien benutzt werden kann, ohne vorherige Kenntnis der klinischen Diagnose. Befunde auf der digitalen Schmerzskala zeigten, dass beim Vorhandensein von Schmerzen das Schmerzniveau nicht mit einer bestimmten Schmerzkategorie korrelierte. Wenn aber diese Skala benutzt wurde, um eine zurückliegende Schmerzerfahrung zu beschreiben, wählten Patienten mit neurologisch bedingtem Schmerz die höchsten Werte bis zu sechs Mal häufiger als Patienten mit tendomyopathischem oder dentoalveolärem Schmerz. Patienten mit tendomyopathischem oder dentoalveolärem Schmerz wählten die niedrigsten Werte bis zu 15 Mal häufiger als jene mit neurologisch bedingtem Schmerz. Dieser Fragebogen kann für eine anfängliche Kategorisierung von Schmerz benutzt werden, kann aber eine gründliche Anamnese und klinische Untersuchung nicht ersetzen.