Diagnostic Terminology: Report of an Online Survey

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Abstract

Introduction: Diagnostic terminology used in endodontics has been based on historical use, textbook and glossary terms, best-available science, and personal conviction. There is minimal evidence that establishes an absolute set of terms that can be used to make a definitive diagnosis. As a component of the Consensus Conference on Diagnostic Terminology held in October 2008, an online survey was conducted to invitees to assess their opinions on diagnosis. Methods: Thirty-six questions were developed by the oversight committee and chairs of the subcommittees. Most questions used a modified Likert scale to generate a response. At least a 51% agreement or disagreement to the statement was considered a consensus, and a response greater than 25% but less than 51% generated a minority report. Results: Thirty-one of the 36 questions were designed to determine consensus. All 31 generated a consensus response, with 14 of those generating a minority report. Minority reports suggest that there was still greater than 25% of the respondents who did not follow consensus. Possible explanations were provided for those statements that generated a minority report. Conclusions: Data from the online survey provided trends and preferences toward particular diagnostic terms and beliefs. The limitations of such a survey are multiple including the limited size and nature of the respondent group, responses based on opinion, and question design. The online survey results suggest an awareness for the specialty to develop better diagnostic tools and terminology that are biologically and metric based. (J Endod 2009;35:1625–1633)

Key Words

Diagnostic terms, diagnostic tests, endodontic diagnosis, endodontic treatment, periapical diagnosis, pulpal diagnosis

The primary purpose of the 2008 American Association of Endodontists Consensus Conference on Diagnostic Terminology was to bring together world-renowned authorities and experts to hear and evaluate the best available evidence in order to arrive at universal recommendations regarding endodontic diagnosis and its associated terminology used. After the conclusion of the conference, the oversight committee constructed an online series of questions for conference participants to answer. Questions were designed to be thought provoking and were based on the series of questions that each of the four submitted papers addressed as well as discussions during the breakout sessions. Many of the questions were specifically constructed to address recommended usage of specific terms and their associated definitions. The oversight committee believed that because there is no one widely accepted definition of consensus, a collectively agreed-on definition of consensus was critical to ensuring that the diagnostic recommendations were representative of the group. After extensive research and discussion by the oversight committee, the recommended consensus definition that was presented to the conference participants was that the goal was to make decisions through which the group strives to reach substantial, although not necessarily unanimous, agreement on matters of overall direction and policy.

For this conference, consensus would be achieved if a concept was supported or not supported by 51% of the conference participants. However, if there was 25% or more of the respondents not in support of consensus, then a minority report would be published as well, thus reflecting the thinking of participants not favoring the majority position or action on an issue. Minority reports may occur for multiple reasons including compelling evidence for both sides, a real or perceived controversy on an issue or term, passionate conviction for specific terms, possible misinterpretation of a question, a poorly written question, or an indication that further research is needed on a subject because evidence is lacking or there is a gap in the knowledge. The conference group was comfortable with this approach because they understood that consensus stresses the cooperative development of a decision with everyone working together rather than competing against each other. Because attendees had reviewed the papers in advance of the conference, they all had the opportunity to contribute their views, discuss their reasons, and were willing to confront and resolve controversy throughout the conference.

Methods

A series of statements based on the four background papers were constructed by the oversight committee and were presented to the conference attendees using an audience response system. During the real-time examination of the responses, the attendees vocalized that many of the statements were poorly constructed and did not provide sufficient scope and depth to the overall topics. In turn, it was decided that the committees who researched the four questions would re-examine the original questions and submit to the oversight committee a final series of questions. These questions were further analyzed and modified by the oversight committee. This set of questions (Figures 1–36) was subsequently delivered to all conference attendees via an online survey.

Sixty-four conference attendees participated in the online survey. Fifty-five percent of those were involved in full-time academia, whereas 35% practiced endodontics either full-time or part-time. Seventy-seven percent of the attendees were 56 years of age or older, and 80% were Diplomates of the American Board of Endodontics. Thirty-six questions were presented to the conference attendees; these are listed later along with their respective results. For the majority of questions, a modified Likert scale was used that eliminated the neutral category (ie, respondents were instructed to select "strongly
agree,” “agree,” “disagree,” or “strongly disagree” to a given statement). The categories of strongly agree and agree were combined as well as categories of strongly disagree and disagree to determine if consensus was achieved (51% or greater). If there was 25% or more of the responses not in support of a consensus despite at least a 51% consensus, then a minority report was generated for the respective question.

**Results**

1. A patient’s response to various testing modalities (eg, thermal, electric pulp test, percussion, and palpation) is a reliable indication of the health status of the pulp and apical tissues.

2. In general, identifying teeth without pulpal/apical disease is more reliable with current diagnostic methods than identifying teeth with pulpal/apical disease.

3. Detecting early and subtle apical changes in bone density can be achieved with newer imaging techniques, such as cone beam computed tomography.

4. During the past 12 months, I have had an opportunity to send a patient to a facility (or use your own) for cone beam computed tomography evaluation for an oral condition (differential diagnosis).

5. Provide in order of importance, the following areas for clinical and laboratory research. (One being most important and four being least important.)

**Figure 1.** Results: 64.6% agreed, whereas 35.4% disagreed.

**CONSENSUS REACHED; MINORITY REPORT GENERATED.** It is speculated that current testing modalities in endodontics may lack the sensitivity and specificity to reliably indicate the status of the pulp and periapical tissues. Responses suggest that better testing modalities should be developed.

**Figure 2.** Results: 62.5% agreed, whereas 37.5% disagreed.

**CONSENSUS REACHED; MINORITY REPORT GENERATED.** The results of the minority report suggest that some believe that the sensitivity of endodontic diagnostic tests is more reliable than the specificity. There have been a number of studies evaluating the sensitivity and specificity of individual tests such as pulp tests. These have been consistent in showing that sensitivity is more reliable than specificity. However, the literature is rather sparse on contemporary studies that evaluate the two parameters for endodontic diagnosis collectively. This statement may have been misunderstood.

**Figure 3.** Results: 90% agreed, whereas 10% disagreed.

**CONSENSUS REACHED. NO MINORITY REPORT.** The group overwhelmingly believed that newer imaging techniques such as cone beam computed tomography would be valuable in detecting early osseous changes.

**Figure 4.** Results: 58% had the opportunity, whereas 42% did not. Geographic location of the respondent and/or availability of a cone beam tomography system may have influenced the results.

**Figure 5.** Results: Critical areas for clinical and laboratory research are (in descending order) differentiation between lesions of endodontic origin from those of nonendodontic origin, crown/root infractions/cracks, reliable means of measuring healing, and pulp conditions that have potential for healing.
6. Pulp testing can reliably distinguish odontogenic pain from non-odontogenic pain.

Figure 6. Results: 63% agreed whereas 37% disagreed.

CONSENSUS REACHED; MINORITY REPORT GENERATED. Similar to the results in statement 1, pulp testing may not reliably differentiate odontogenic pain from non-odontogenic pain. Consistent with statement 2, the specificity and sensitivity of pulp testing, with respect to odontogenic versus nonodontogenic pain, have not been adequately studied.

7. Diagnostic terms for pulpal and apical conditions should relate directly to treatment options.

Figure 7. Results: 65% agreed, whereas 35% disagreed.

CONSENSUS REACHED; MINORITY REPORT GENERATED. Many respondents indicated that diagnostic terminology should not necessarily dictate specific treatment options. The opinion voiced at the conference was that, although the diagnosis represents the condition that the patient presents with, the treatment might change depending on newer innovations, patient characteristics, or other circumstances.

8. Irreversible pulpitis should be further described as symptomatic or asymptomatic.

Figure 8. Results: 57% agreed, whereas 43% disagreed.

CONSENSUS REACHED; MINORITY REPORT GENERATED. Although consensus was reached, the high percentage of the minority report indicates a strong conviction for not further differentiating irreversible pulpitis into asymptomatic and symptomatic. Individuals who responded in the disagreement category may be more oriented toward a repair-predictive approach in endodontic diagnosis especially in light of potential regenerative procedures or they categorically believe that the asymptomatic vital pulp cannot be diagnosed as irreversible pulpitis.

9. A clinical presentation of lingering pain to cold and hot, and a history of spontaneous pain in a tooth should be classified as:

Figure 9. Results: 51% in favor of irreversible pulpitis and 49% in favor of symptomatic irreversible pulpitis.

The results are similar to those from statement 8 and represent a strong desire to include the descriptive symptomatic when there is lingering thermal pain and a history of spontaneity.

10. A fully developed mature tooth that has a carious exposure with normal bleeding but minimal or no pain should be given a pulpal diagnosis of:

Figure 10. Results: 57% preferred the diagnosis of asymptomatic irreversible pulpitis, whereas 43% preferred irreversible pulpitis.

In concert with the results from statement 8, the consensus represents usage of the descriptor asymptomatic when there is normal bleeding after carious exposure in a mature tooth. However, the statement may be misleading in that it is more related to providing a postoperative diagnosis in a specific case scenario in which the initial diagnosis was likely reversible pulpitis or a normal pulp before caries removal.
11. Pulpalgia is a more accurate term than pulpitis for a tooth with pulpal symptoms of pain.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The results suggest a realization that pulpalgia may be a better term to indicate pain than irreversible pulpitis, which represents a histologic description of inflammation. The question remains whether the respondents truly wish to replace the traditional term of pulpitis with pulpalgia.

12. Dentin hypersensitivity is a form of pulpitis.

CONSENSUS REACHED; MINORITY REPORT GENERATED. In this case, 68% disagreed that dentin hypersensitivity is a form of pulpitis and may be relegated to its own diagnostic category. Although not substantiated, dentin hypersensitivity may be more representative of a form of pulpalgia rather than pulpitis. The minority believed that because the pulp presents with unusual symptoms in this condition, an inflammatory state is likely to be present.

13. Hyperplastic pulpitis or pulp polyp is a type of irreversible pulpitis.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agreed that a pulp polyp is a form of irreversible pulpitis. This diagnostic entity would likely be categorized as a rare form of asymptomatic irreversible pulpitis if descriptors were considered.

14. Internal resorption is a type of irreversible pulpitis.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agreed that internal resorption is a form of irreversible pulpitis. This diagnostic entity would likely be categorized as a rare form of asymptomatic irreversible pulpitis.

15. If descriptors are used for irreversible pulpitis, chronic and acute are better diagnostic terms for pulpal disease than symptomatic and asymptomatic.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The respondents overwhelmingly preferred the terms symptomatic and asymptomatic over chronic and acute if descriptors were used. Although a minority believed that these terms are appropriate, the usage of acute and chronic may yield conflicting meanings depending on whether the terms are in reference to time span, degree of pain, or histologic status.
16. The diagnostic term that best describes the pulp in a single-rooted tooth that is nonresponsive to vitality testing and has radiographic signs of calcification is:

![Diagram]

**Figure 16.** Results: 78% in favor of pulp calcification/mineralization, 16% in favor of pulp necrosis, and 6% in favor of normal pulp.

Assuming the periapical osseous architecture is normal, the respondents believe this diagnostic entity is based primarily on the radiographic appearance of the canal system in conjunction with a nonresponse to pulp testing.

17. Radiographic criteria that are presently used to assist in the determination of apical disease states require refinement and preciseness to reduce levels of disagreement among dental practitioners.

18. Acute or chronic apical periodontitis are the preferred diagnostic terms over symptomatic or asymptomatic apical periodontitis.

![Diagram]

**Figure 17.** Results: 93% agreed, whereas 7% disagreed.

**CONSENSUS REACHED; MINORITY REPORT.** The respondents overwhelmingly agreed the need for clinicians to be precise when using radiographic criteria to determine apical disease.

19. Acute apical abscess is the preferred diagnostic term for an inflammatory reaction to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness to pressure, pus formation, and swelling.

![Diagram]

**Figure 18.** Results: 37% agreed, whereas 63% disagreed.

**CONSENSUS REACHED; MINORITY REPORT.** When describing apical periodontitis, there is significant preference for the use of symptomatic and asymptomatic over acute and chronic. Although these preferred terms would be out of line with the medical model in which acute and chronic are used with consistency in diagnosis, misinterpretation and mixed meanings of such terms continue to be the norm.

20. The presence of an isolated pocket with purulence traceable to the tooth with pulp necrosis is an indication for a diagnosis of chronic apical abscess rather than chronic apical periodontitis.

![Diagram]

**Figure 19.** Results: 83% agreed, whereas 17% disagreed.

**CONSENSUS REACHED; NO MINORITY REPORT.** The respondents overwhelmingly agreed with the characteristics of an acute apical abscess.

21. The presence of an isolated pocket with purulence traceable to the tooth with pulp necrosis is an indication for a diagnosis of chronic apical abscess rather than chronic apical periodontitis.

![Diagram]

**Figure 20.** Results: 77% agreed, whereas 23% disagreed.

**CONSENSUS REACHED; NO MINORITY REPORT.** The respondents overwhelmingly preferred the term chronic apical abscess when there was an isolated pocket with purulence traceable to a tooth with pulp necrosis.
21. The diagnosis of a tooth with acute apical periodontitis implies both pain to percussion and the presence of an apical infection.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The results here may be indicative of a number of issues. An acute apical periodontitis may not necessarily imply infection because there may be other etiological factors. There may be mixed views on what an acute apical periodontitis truly represents including inflammation, infection, or both. The question itself may be poorly designed, resulting in misinterpretation. The disagreement may also be with the term “acute,” which would be consistent with what the respondents indicated on the preferred terms for pulpal diagnosis.

22. Defining the degree of pain would be valuable to the diagnosis of acute versus chronic, (or symptomatic versus asymptomatic) apical periodontitis.

CONSENSUS REACHED; MINORITY REPORT GENERATED. Although respondents recognized that defining the degree of pain would assist in determining the apical diagnosis, it is difficult to firmly establish why there was 40% disagreement. This could be related to the unique challenge of assessing pain because of its multiple components and subjective variability or because of the belief by some that the variation in pain may be related to pain threshold without the presence of a distinct disease process.

23. Although the terms apical, periapical, and periradicular are interchangeable, apical is the preferred term.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The use of the term apical appears to be the consensus preference, although the remaining terms can be used interchangeably, particularly the term periapical, which has been an historic favorite.

24. An acute apical abscess implies the presence of a visible or palpable swelling.

CONSENSUS REACHED; MINORITY REPORT GENERATED. In contrast to question 18, this question focuses specifically on the presence of a visible or palpable swelling. Although the consensus agreed, a significant number believe that an acute apical abscess may not necessarily manifest itself with an obvious swelling, such as when it is confined to the periapical area without expansion through the cortical plates.

25. The diagnostic designation of symptomatic apical periodontitis indicates there is significant moderate to severe pain, either without an apical radiolucency or with evidence of radiographic changes.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The results of the survey are shown in the figures below. Figure 21: Results: 33% agreed, whereas 67% disagreed. Figure 22: Results: 60% agreed, whereas 40% disagreed. Figure 23: Results: 66% agreed, whereas 33% disagreed. Figure 24: Results: 60% agreed, whereas 40% disagreed. Figure 25: Results: 87% agreed, whereas 13% disagreed.
CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agreed that with respect to symptomatic apical periodontitis, there is significant moderate to severe pain irrespective of the radiographic status of the apical area.

26. Records should indicate both pretreatment diagnoses based on signs and symptoms as well as a post-treatment diagnosis based on ultimate findings or at least documentation of the information gleaned after the endodontic procedure.

CONSENSUS REACHED; NO MINORITY REPORT. The results strongly suggest that, in addition to the pretreatment diagnosis, there should be a post-treatment diagnosis based on clinical findings or at least documentation of any findings noted during the procedure. This implies that the post-treatment diagnosis is the more definitive diagnosis and logically increases the probability of selecting a better treatment plan because the pretreatment diagnosis is a tentative one or is potentially incorrect.

27. Chronic apical abscess is characterized by gradual onset, little or no discomfort, and the intermittent discharge of pus through an associated sinus tract.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agreed with the characteristics associated with a chronic apical abscess.

28. The term “condensing osteitis” implies the presence of a radiopacity at the root apex, which is suggestive of a proliferative bone response to a chronic irritant.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agreed that condensing osteitis is represented by the presence of a radiopacity at the root apex, suggestive of a bony response to a chronic irritant.

29. There are insufficient data available to predict the outcomes of various endodontic treatment modalities.

CONSENSUS REACHED; MINORITY REPORT GENERATED. The results here suggest an almost even split between those who believe there are enough data to predict outcomes of various endodontic treatment modalities and those who do not. The question may have led to more definitive results if the various modalities had been further delineated. The disagreement may also be related to whether levels of evidence available in the literature for the different treatment modalities are sufficient accurate predictors of outcomes.

30. The treatments suggested and the levels of evidence available for each of the pulpal diagnostic categories in Tables 1-6 are acceptable. (See Tables 1-6 in article by Rosenberg et al in these proceedings.)
CONSENSUS REACHED; NO MINORITY REPORT. The respondents strongly agreed that the overall recommended treatments and levels of evidence for each of the pulpal diagnostic categories listed in the Rosenberg et al. article are acceptable. It should be noted that results could vary depending on the specific pulpal diagnostic category. This response may also mean that the respondents believed that the article for Question 4 that summarized the available data and levels of evidence was acceptable.

31. The treatments suggested and the levels of evidence available for each of the apical diagnostic categories in Table 7 are acceptable. (See Table 7 in article by Rosenberg et al in these proceedings.)

CONSENSUS REACHED; NO MINORITY REPORT. The respondents strongly agreed that the overall recommended treatments and levels of evidence for each of the apical diagnostic categories listed in the Rosenberg et al. article are acceptable. It should be noted that results could vary depending on the specific apical diagnostic category. This response may also mean that the respondents believed that the article for Question 4 that summarized the available data and levels of evidence was acceptable.

32. Because of the serious or even mortal consequences of misdiagnosis, it is compelling to establish an accurate (definitive) postoperative diagnosis.

CONSENSUS REACHED; NO MINORITY REPORT. Similar to question 25, the results overwhelmingly suggest the importance of establishing an accurate postoperative diagnosis.

33. Pulp capping and pulpotomy for mature teeth with carious exposure should receive new research attention.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents overwhelmingly agree that more research should be targeted toward vital therapy procedures in mature teeth.

34. An investigative model should be developed relating histologic conditions and molecular factors to a patient’s clinical presentation as a means of validating the relevance of diagnostic terminology.

35. Diagnostic terms for pulpal/apical disease should be biologically and metric-based terms.
CONSENSUS REACHED; NO MINORITY REPORT. Respondents overwhelmingly believe that because of the myriad of problems associated with current diagnostic terminology and their relative inability to accurately assess disease states, there needs to be a focused directive toward developing a new set of diagnostic terms that are both biologically and metric based. This goal is explicit as one of the key long-term projects of the consensus conference.

36. Outcome terminology (eg, success/failure versus healed/healing/diseased/nonhealed versus functional/nonfunctional) should be standardized.

CONSENSUS REACHED; NO MINORITY REPORT. The respondents almost unanimously agreed that because of the wide and inconsistent methods for evaluating outcomes, outcome terminology needs to be standardized. This represents an area of priority for future conferences.

Figure 36. Results: 97% agreed, whereas 3% disagreed.

CONSENSUS REACHED; NO MINORITY REPORT. Although the data from this question survey provide trends and preferences, many of the choices may have been made based on the empirical use or beliefs on the part of many of the participants, hence the need for a minority report. In addition, these data are based on a select group of experts whose opinions were rendered on abstract descriptions of common clinical scenarios rather than on specific cases, which may have different combinations of clinical and diagnostic factors. Likewise, historic data or best evidence available, although often confusing because of the interplay of the histopathological findings with clinical decisions, may not have been fully assessed or integrated into the responses made by the participants, again supporting a minority report. Therefore, the survey in itself may have suffered from the inability to capture the nuances and to filter out the personal choices as opposed to being evidence based in its makeup. In actuality, the data gleaned in this endeavor are not evidence based and may not even reflect the best evidence.

This scenario only emphasizes the need to continue to assess these aspects of endodontics, and, hopefully, with directives in determining better diagnostic methodologies that have greater predictable accuracy and precision, this can be accomplished. This is certainly a beginning, and it serves as a call to arms for the specialty to move in this direction with intensity because the dilemma we face in defining our diagnostic scheme may have actually been highlighted by Aristotle when he wisely remarked that we should not expect greater precision in defining a subject than the subject itself allows. However, with the expansion of all aspects of science beyond the borders of dentistry and the integration of these developments into our endodontic specialty, maybe we can begin to define endodontics and its inherent diagnostic procedures in ways never before imagined by our forefathers.

Conclusions

Although the data from this question survey provide trends and preferences, many of the choices may have been made based on the empirical use or beliefs on the part of many of the participants, hence the need for a minority report. In addition, these data are based on a select group of experts whose opinions were rendered on abstract descriptions of common clinical scenarios rather than on specific cases, which may have different combinations of clinical and diagnostic factors. Likewise, historic data or best evidence available, although often confusing because of the interplay of the histopathological findings with clinical decisions, may not have been fully assessed or integrated into the responses made by the participants, again supporting a minority report. Therefore, the survey in itself may have suffered from the inability to capture the nuances and to filter out the personal choices as opposed to being evidence based in its makeup. In actuality, the data gleaned in this endeavor are not evidence based and may not even reflect the best evidence.

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