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Trigeminal neuralgia: Caring for patients with trigeminal neuralgia

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Abstract

To provide the patient with the best possible outcomes, it is crucial that the dental hygienist be able to detect possible signs and symptoms associated with trigeminal neuralgia. Understanding the pathophysiology behind trigeminal neuralgia, as well as identifying associated risk factors and incidence, assists the dental hygienist with this detection. To optimize care of the patient, the dental hygienist must also be able to instruct the patient on best practices to promote oral health as well as attending follow-up care with their primary health-care provider. For individuals who do not have a relationship with a primary health-care provider, the dental hygienist should be able to provide necessary referral information.

Educational objectives

Upon completion of this course, the dental hygienist should be able to:

1. Identify pathology associated with trigeminal neuralgia
2. Define the differences between the three categories of trigeminal neuralgia
3. Discuss assessment tools used to diagnose the condition
4. Provide treatment options, referrals, and other resources
5. Assess mental health stressors associated with trigeminal neuralgia



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The pain of trigeminal neuralgia (TN) is severe and similar to a shock. It is experienced by the individual on one side of the face, radiating through the lower jaw and cheek, often with no warning, but with such intensity that the individual is momentarily incapacitated.¹ Following one or more paths along the trigeminal nerve, TN is often misdiagnosed, misunderstood, and mistreated.² The pain can be experienced as stabbing or piercing and can last up to several minutes.³

Background and prevalence

Impacting a relatively small number of individuals, with prevalence noted at 0.012%, TN typically is seen in females between the ages of 50 and 70.⁴ Because there are no distinct risk factors and the etiology of TN is generally unknown, diagnosis is determined by the relationship between arterial or venous blood pressure exerted on the fifth cranial nerve as well as previous diagnosis of multiple sclerosis (MS) or tumor.⁵ Associated with sensation of both the mandibular and maxillary facial regions, this neurological disorder arises from an unknown origin in the fifth cranial nerve.¹ Pain is often experienced on the right side between the second and third trigeminal divisions, impacting intraoral and extraoral sensations.⁶ Although TN may be caused by an abnormal loop of the cerebellar artery, it is more commonly associated with vascular compression of the trigeminal nerve root.⁷ Hagler found that this constant artery compression could result in nerve atrophy and myelin sheath destruction. Degenerative changes noted in the sensory ganglion may also impact the alteration in impulse transmission.⁸

Because similar symptoms are seen with different pathologies, TN is easily misdiagnosed. Myofascial pain/dysfunction, which begins in muscles associated with jaw movement as well as temporomandibular joint syndrome, mimics TN pain, and may result in an inaccurate TN diagnosis.⁹ Additionally, the diagnosis of MS should be ruled out, as close to 5% of individuals with TN have undiagnosed MS.¹⁰

Classifications

There are three etiological categories that have been developed by the American

Academy of Neurology to assist in classification and diagnostic grading, which include *idiopathic trigeminal neuralgia*, *classical TN*, and *secondary TN*.¹¹ To clarify the different categories, idiopathic TN is diagnosed via magnetic resonance imaging (MRI) and noted as having no underlying cause. Classical TN differs slightly with the acknowledgement of changes in the trigeminal nerve root. Finally, secondary TN is associated with an underlying disease process.¹² For the categories of idiopathic and classical trigeminal neuralgia, it is necessary to subdivide them relative to pain, with pain being reported as continuous or paroxysmal.¹³ Classical pain, which is caused by vascular compression of the trigeminal nerve root, begins intermittently and abruptly, and can last several minutes. When the period of intermission fades, the sensations are experienced for longer periods of time.¹⁴ Individuals falling into the classical pain category share reports of daily pain, which feels similar to tingling or burning.² Individuals within this category share a history of multiple trigger zones, some which do not coordinate with the location of pain. These trigger zones, typically experienced along the nasolabial area, both lips, chin, and/or cheek, may be as small as a pinhead or as large as the entire side of the face.⁷

Another category, secondary TN, exhibits pain that does not resemble that experienced by the patient with classical TN. This pain is reported as aching or throbbing and may be continuous. Secondary TN stems from a major neurological disease, such as MS, cysts, or tumors.⁶

Commonly referred to as the fifth vital sign, the assessment of pain is an integral part of the provision of care.¹⁵ As defined by the International Association for the Study of Pain, the presence of pain includes a physical and emotional experience.¹⁶ This experience is wholly owned by the individual and is reported by subjective perception. From that vantage, it is necessary to view pain as how an individual chooses to describe it.¹⁷ When undertreated or untreated, pain can manifest not only as a physiological response but as a psychological one.¹⁸ Because the impact of untreated/undertreated pain

can impact the individual holistically, Healthy People 2020 noted the extended relationship to quality of life.¹⁹

When assessing the individual for pain, using the appropriate pain-measurement device is essential. Consistent use of the correct device can assist with short-term tracking of pain relief methods (X treatment given with resulting decrease in perceived pain) as well as long-term tracking of pain (X treatment initiated with long-term pain relief). A variety of pain-measurement tools are available. The Visual Analog Scale (VAS) utilizes a single horizontal line that denotes no pain on one end and “pain experience as bad as it could possibly be” at the other end. The individual indicates where their pain experience is on this continuum.^{16,20} This tool is effective when the individual needs a visual representation of their pain experience. Similarly, the Numeric Pain Intensity Scale uses a 0 to 10 scale, with 0 indicating no pain and 10 indicating the most pain that individual has ever experienced.²¹ This tool is effective when the patient is able to cognitively rate their pain in relation to previous experience, as well as provide a nominal score to rank the experience. When a more visual representation is needed, Wong-Baker FACES Pain Rating Scale may be appropriate. This scale provides the individual with visual representation of simple face diagrams, with a smiling face demonstrating “no hurt,” extending through a grimacing face demonstrating “hurts even more,” to a face with an exaggerated frown and tears demonstrating the extreme “hurts worst.”²²

Pain related to TN does not differ in expression or experience from other pain. Although the pain may vary in sensation and location, it is completely dependent upon the experience of the individual. As such, it is essential to consistently assess and modify treatment until either an acceptable level of discomfort is found, or the pain is eradicated. As mentioned above, failure to treat the experience of TN pain accurately and appropriately can lead to emotional duress, which can significantly impact the individual’s quality of life. Being able to effectively manage pain depends on the ability of the patient to communicate the pain most accurately

in a language shared with the health-care provider.²³

Diagnosis and treatment

The diagnosis of TN is based almost entirely on history and relies on the ability of the clinician to recognize a series of signs and symptoms to define the disorder.¹⁴ It may be difficult for patients to describe the location or sensation of neuropathic pain conditions.² These descriptors include electric lancinating, burning or tingling, along with triggers in sensory zones while speaking, eating, drinking, chewing, or brushing teeth.^{2,24-26} Typically, the duration of pain does not last more than two minutes per attack, and it should be emphasized that patients are characteristically symptom-free between attacks.²⁵ As remission time gets shorter, attacks of pain get longer, with 65% of patients experiencing another episode within five years.¹⁴

Many acute, chronic, and recurrent conditions occur in the orofacial region.² Because dental pain is extremely common, a dental visit may be warranted in suspicion of an oral pathology. Hygienists and dentists have broad knowledge and expertise evaluating and treating pathologies of the head and neck.⁷ A sensory examination should be conducted, including an intra- and extraoral exam, palpating the lips, mucosal surfaces, and oral cavity including the tongue, palate, tonsils, and oropharynx to identify intraoral triggers or focal sensory loss.^{14,25,27} A patient interview can also be conducted to help define the diagnosis, with special attention paid to the onset and location of pain. Determining if the pain originates from the teeth, is evoked by chewing, if there is bilateral pain in the temporomandibular area, or intense stabbing isolated to the scalp or occipital area will promote proper diagnosis and referral.²⁶ If the hygienist suspects TN, a referral should be made to a specialist, such as a neurologist, to prevent unnecessary or irreversible dental treatment in pursuit of relief.^{14,28,29}

Historically, research has been guided by headache neurologists and epidemiological studies.^{14,30,31} Because TN and MS symptoms mimic each other, a history of neurological symptoms should be asked,

specifically for those patients who are younger than typically seen.²⁵ In more recent years, the International Headache Society defined strict clinical criteria for TN diagnosis.³² A diagnosis can be made when at least three attacks of unilateral facial pain occur fulfilling these criteria: pain occurring in one or more divisions of the trigeminal nerve with no radiation beyond the trigeminal distribution, and pain with at least three of the following four characteristics: a) recurring in paroxysmal attacks lasting from a fraction of a second to two minutes; b) severe intensity; c) electric shocklike, shooting, stabbing, or sharp in quality; and d) precipitated by innocuous stimuli to the affected side of the face.³⁰

The use of a good assessment tool to evaluate outcomes is important in determining the baseline pain experienced, as well as efficacy of interventions.⁷ A variety of screening tools can assess patients based on verbal pain descriptors, although not all are reliable or valid; thus the utilization of VAS or the Numeric Pain Intensity Scale. To differentiate from MS, diagnosis for idiopathic, classical, and secondary TN relies on imaging, such as MRI, which provides a clear view of the cranial nerves and cerebral vessels.^{28,33} Although a routine brain MRI is important for the diagnosis of a variety of conditions, a dedicated TN MRI protocol is recommended for further assessment.^{24,34} The MRI must also be reviewed by a neurosurgeon with expertise in this condition for evaluation and treatment options.²⁴

Treatment of TN is managed by medical, dental, and surgical health-care professionals with various treatment approaches.³⁴ Because specialized treatment modalities, such as pharmacological treatment, microvascular decompression, radiosurgery, and percutaneous trigeminal ganglion techniques exist, TN must be accurately diagnosed to manage the condition.³⁵ Other modalities can assist in providing temporary pain relief, including nutritional therapy, biofeedback, acupuncture, and botulinum toxin-A (Botox).^{8,36}

TN responds to a selection of antiepileptic medications, such as carbamazepine, phenytoin, and gabapentin; however,

high dosages are necessary to provide relief.^{26,28,30,37} These medications often fail to relieve pain, are debilitating, and may cause serious side effects such as cognitive impairment, memory loss, and bone marrow suppression.³⁷ Nonsteroidal anti-inflammatory drugs, tricyclics, analgesics, and opioids provide minimal pain relief and are not commonly recommended. Experimental modalities have been studied recently, including gabapentin in conjunction with ropivacaine injections, but further studies need to be conducted.³⁰ Surgical treatment is typically reserved for those patients whose pain is debilitating and cannot be controlled with at least three medications.²⁸

The first choice of surgery, with high efficacy, is microvascular decompression (MVD).^{26,38,39} The aim of this procedure is to remove the suspected compression of the nerve by a loop of an artery near the brain stem.⁴⁰ It is performed under general anesthesia with the greatest degree of safety and by neurosurgeons who perform trigeminal procedures regularly.²⁸ Following the procedure, patients often receive immediate relief. Minimal side effects include risk of injury to other facial nerves, hearing loss, and sensory disorders.^{39,40}

Radiosurgery involves irradiation of small-volume targets inside the cranium with high-dose radiation in a single session.^{37,38} This surgery is the least invasive nonpharmacological procedure and has a high success rate, but half of the patients will experience recurrences of pain.^{28,39}

Percutaneous balloon compression is a minimally invasive procedure that is the preferred choice in elderly patients or those not willing to undergo MVD.³⁹ It offers immediate postoperative pain relief; however, there is insufficient data about the long-term quality of life.³⁰

Though there is no scientific evidence to support surgery early in the disease, studies indicate patients would have opted for surgery sooner if they had the chance, as the surgery is more favorable than the typical pain associated with TN attacks.^{28,38,41} The consequences of living with the condition can disrupt daily functioning and quality of life, along with anxiety, depression, and feelings of

isolation.⁴² Optimal management can only be achieved by accurate and complete diagnosis from medical, dental, and other health-care professionals.²

Case study

An overall healthy 39-year-old female presented to her local emergency room with the chief complaint of tingling and intermittent numbness on the left side of the face, specifically the upper lip, after her general physician was concerned that she might be having a stroke. Once in the emergency room, various tests were conducted, including CT scan and MRI, to rule out a stroke. Over the next few weeks, additional tests, such as spinal taps, were conducted to determine if the patient had MS. No lesions were seen on the brain, and no other indicators associated with MS were found. The patient was then referred to a neurologist, who insisted she was suffering from MS, although test results consistently came back negative. Throughout the next several months and taking a variety of medications, including antiepileptics, analgesics, and opioids, the tingling and numbness spread to all three branches of the trigeminal nerve. The pain was sporadic and felt like lancing shocks in the scalp and occipital areas, lasting for several minutes.

After multiple uneventful appointments with the neurologist, the increased medications and pain were becoming debilitating for the full-time working mother. On a numeric pain intensity scale, her pain was consistently a 10. One month prior to the initial onset, the patient had received routine bitewings, a periodic exam, and prophylaxis, and therefore associated the symptoms with that dental visit. She did not return or call the dental office, and over the course of the year, she neglected all dental care in fear of pain from brushing or simply opening her mouth wide. Nonalcoholic mouthwash was used daily; brushing with a power toothbrush was sporadic. Brushing with a manual brush became nonexistent due to the back-and-forth motion of the brush against the lips and cheek, which provoked an episode.

Through the next four years, the patient experienced persistent migraines

and began to feel intense pain through the maxillary division (V2), 10 on the pain scale. Another episode caused the patient to return to the emergency room, where she reported “the left side feeling raw, as if someone was constantly rubbing sandpaper, with unending shocks to the cranial nerve.” During this emergency room visit, the patient was treated by a different neurologist, who immediately ordered a TN MRI protocol. The scan revealed a loop of vessels around the brain stem, and the patient was diagnosed with secondary TN. Various procedures were recommended, with microvascular decompression being the most suitable. The patient elected to undergo surgery by a referred neurologist who specialized in the procedure. Hours after surgery, the pain was almost nonexistent, a 1–2 on the pain scale. While taste sensations were regained and shocking sensations were alleviated, numbness was still present. At the six-week postsurgical visit, the patient reported numbness in the maxillary division (V2), but she was no longer experiencing any episodes and was taken off all medications.

Living in constant fear of recurrence, the patient waited three years after surgery to return to the dentist for routine procedures. The hygienist was allotted extra time for visits and would cautiously, but thoroughly, perform intra- and extra-oral examinations, bitewing radiographs, periapicals if warranted, and prophylaxis, allowing multiple intervals for rest. Caution and care were exercised, assuring the patient was not required to open her mouth any wider, or for any longer, than necessary to perform the required dental procedures. The patient felt comfortable returning for dental care only due to the consideration of the dentist and dental staff, which included their own personal study of TN on her behalf. Recare appointments were continued every six months.

Implications for the dental hygienist

Patients with neuropathic orofacial pain require dental treatment, either as routine maintenance or as emergency visits.⁷ Social withdrawal, pain, and fear of recurrence associated with TN can cause patients to avoid all dental care,

as noted in the case above. Multiple medications cause decreased salivary flow and increased caries, so routine application of fluoride varnish and daily fluoride exposure are necessary.⁴³ Facial weakness and bilateral numbness cause the patient to have less cleansing on one side and more abundant plaque. Aphthous ulcers can also form due to mastication while experiencing numbness. To minimize stimulation but aid in plaque removal, recommendation of an extra-soft toothbrush or power toothbrush will allow the patient to control and avoid any unnecessary, harsh movements. The hygienist can suggest a variety of interdental aids that can be used based on the patient’s preference and tooth anatomy. When the patient experiences an episode and is unable to brush, a soft foam can be soaked in chlorhexidine to serve as an antiseptic.³⁶

Avoiding unnecessary, invasive hygiene procedures and allowing additional time to treat patients with a history of TN can provide a more comfortable appointment for the patient.^{36,42} This study confirms patients consistently live in fear of an episode and can feel isolated or withdrawn, hopeless, and even suicidal.⁴² Equipped with knowledge about TN and its manifestations, dental hygienists can greatly assist in diagnosis and referral of patients and offer recommendations to provide optimum oral health for patients.

Conclusion

Dental professionals are commonly the first point of contact for patients with chief complaints involving the orofacial region. It is important that clinicians are aware of TN symptoms, as the key to success is timing. By identifying location and evaluation of pain on a numeric scale, patients can better relay symptoms, because a visual examination is not diagnostic for this condition. Failure to identify the source of the patient’s problem may lead to erroneous and ineffective treatment. Important to note is that even when treatment procedures are successful, those who have suffered from TN may still be fearful and reticent about seeking proper dental care. The case study provides a cursory observation regarding the importance of the dental hygienist’s

role in assuring that those with a history of TN feel comfortable to resume essential dental health prevention and/or treatment. The value of compassion is difficult to measure, but it can clearly make a significant difference in the lives of TN sufferers. Awareness of the disease and patience with delays or additional preparation may help create a dental environment where those with a history of TN can feel safe.

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QUESTIONS

1. Trigeminal neuralgia is typically experienced by:
 - A. Females in their teens
 - B. Females in their 40s to 60s
 - C. Males in their teens
 - D. Males in their 20s to 30s
2. Trigeminal neuralgia is experienced by:
 - A. Less than 1% of the population
 - B. Between 1% and 5% of the population
 - C. Approximately 10% of the population
 - D. Over half of middle-age women
3. Trigger zones for TN:
 - A. Are experienced at the exact location as the associated pain
 - B. Are completely dependent upon air temperature
 - C. Vary between individuals
 - D. Are experienced at set times daily
4. Which of the following is *not* a classification of TN as determined by the American Academy of Neurology?
 - A. Classical TN
 - B. Idiopathic TN
 - C. Fundamental TN
 - D. Secondary TN
5. Trigeminal neuralgia pain is often described as all of the following except:
 - A. A burning sensation
 - B. A shocking sensation
 - C. A tingling sensation
 - D. A dull throb
6. Trigeminal neuralgia pain is most commonly experienced:
 - A. In the region of the lips
 - B. In the region of the chin
 - C. Around the cheek area
 - D. All the above
7. Which pain-measurement tool utilizes a single horizontal line that denotes no pain on one end and “pain experience as bad as it could possibly be” at the other end?
 - A. Wong-Baker FACES Pain Scale
 - B. Visual Analog Scale
 - C. Numeric Pain Intensity Scale
 - D. FLACC Pain Scale
8. Which pain-measurement tool uses a 0 to 10 scale, with 0 indicating no pain and 10 indicating the most pain that the individual has ever experienced?
 - A. Wong-Baker FACES Pain Scale
 - B. Visual Analog Scale
 - C. Numeric Pain Intensity Scale
 - D. FLACC Pain Scale
9. Which individual would best benefit from using the Wong-Baker FACES Pain Scale?
 - A. A 36-year-old female who has undergone previous orthopedic surgeries
 - B. A 45-year-old experiencing a heart attack
 - C. A 29-year-old developmentally delayed individual
 - D. A 65-year-old male with a college education
10. Which statement best describes the Numeric Pain Intensity Scale?
 - A. It is best to rate your pain with a range of numbers.
 - B. A zero indicates the worst pain ever experienced.
 - C. If zero is no pain and 10 is the worst pain, what number demonstrates your current pain level?
 - D. A 10 indicates that you are experiencing no pain.
11. Which statement best demonstrates the dental hygienist’s description of the Wong-Baker FACES Pain Scale to an 8-year-old?
 - A. Point to the picture that best describes how you feel when you are not hurting at all.
 - B. Point to the picture that best describes how you feel when you hurt some.
 - C. Point to the picture that best describes how you feel when you hurt the worst.
 - D. All of the above are correct.
12. When should pain be assessed?
 - A. At every dental appointment
 - B. Just when the patient appears to be in pain
 - C. Every 15 minutes during an appointment
 - D. Never, unless indicated by the planned procedure
13. Consistent use of an appropriate pain scale can:
 - A. Provide the health-care provider with an understanding of the individual’s perception of pain
 - B. Provide information about the effectiveness of short-term treatment for TN pain
 - C. Provide information about the effectiveness of long-term treatment for TN pain
 - D. All of the above
14. Which of the following classifications of TN refers to the presence of trigeminal neuralgia for no known reason?
 - A. Classical TN
 - B. Idiopathic TN
 - C. Fundamental TN
 - D. Secondary TN
15. Trigeminal neuralgia is often misdiagnosed as:
 - A. Myofascial pain
 - B. Temporomandibular joint syndrome
 - C. Multiple sclerosis
 - D. All of the above

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QUESTIONS

16. Which of the following offers patients almost immediate relief with minimal to no recurrence of pain?
- Microvascular decompression
 - Pharmacological therapy
 - Radiosurgery
 - Percutaneous balloon compression
17. Typically, pain does not last longer than ____, with intervals of remission.
- 30 seconds
 - 2 minutes
 - 5 minutes
 - 8 minutes
18. The clinician should be able to recognize signs and symptoms to define the disorder. TN is diagnosed strictly through radiography.
- Both statements are true.
 - Both statements are false.
 - The first statement is true; the second statement is false.
 - The first statement is false; the second statement is true.
19. An intraoral exam includes palpation of:
- Mucosal surfaces
 - Tongue
 - Palate
 - All of the above
20. What medical professional is characteristically responsible for diagnosing TN?
- Dentist
 - Primary care provider
 - Neurologist
 - ER physician
21. What diagnostic tool provides a clear view of cranial nerves and cerebral vessels?
- CBCT
 - MRI
 - CT scan
 - Panoramic
22. Which of the following is an important aid in diagnosing trigeminal neuralgia?
- CT scan
 - Brain MRI
 - CBCT
 - Panoramic
23. Which classification of medication is most commonly recommended for patients with TN to relieve pain?
- NSAIDs
 - Tricyclics
 - Antiepileptics
 - Opioids
24. Chronic pain associated with TN can cause patients to feel:
- Isolated
 - Withdrawn
 - Depressed
 - All of the above
25. Which procedure is best for patients who are unwilling to undergo MVD?
- Radiosurgery
 - Percutaneous balloon compression
 - Deep brain stimulation
 - None of the above
26. The dental office should not perform intra- and extraoral exams to prevent stimulation. The dental provider should be allowed extra time to treat patients for a more comfortable appointment.
- Both statements are true.
 - Both statements are false.
 - The first statement is true; the second statement is false.
 - The first statement is false; the second statement is true.
27. Which is an effective way to minimize oral stimulation, which may exacerbate pain in the patient with TN?
- Extra-soft toothbrush
 - Power toothbrush
 - Soft foam soaked in chlorhexidine
 - All of the above
28. Surgical treatment for TN is selected when:
- Pharmacological treatment has not been effective
 - The initial diagnosis of TN is made
 - The client reaches puberty
 - The client's insurance dictates this option
29. What condition is often associated with TN?
- Diabetes
 - Cerebral palsy
 - Multiple sclerosis
 - Leukoencephalopathy
30. Intraorally, patients suffering from TN may experience all of the following, except:
- Mucositis
 - Increased caries
 - Increased plaque
 - Xerostomia

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ANSWER SHEET

Trigeminal neuralgia: Caring for patients with trigeminal neuralgia

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Educational Objectives

1. Identify pathology associated with trigeminal neuralgia
2. Define the differences between the three categories of trigeminal neuralgia
3. Discuss assessment tools used to diagnose the condition
4. Provide treatment options, referrals, and other resources
5. Assess mental health stressors associated with trigeminal neuralgia

Course Evaluation

1. Were the individual course objectives met?

Objective #1: Yes	No	Objective #3: Yes	No	Objective #5: Yes	No
Objective #2: Yes	No	Objective #4: Yes	No		

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

- | | | | | | | |
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| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
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| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
| 5. How do you rate the author's grasp of the topic? | 5 | 4 | 3 | 2 | 1 | 0 |
| 6. Please rate the author's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
| 7. Was the overall administration of the course effective? | 5 | 4 | 3 | 2 | 1 | 0 |
| 8. Please rate the usefulness and clinical applicability of this course. | 5 | 4 | 3 | 2 | 1 | 0 |
| 9. Please rate the usefulness of the references. | 5 | 4 | 3 | 2 | 1 | 0 |
| 10. Do you feel that the references were adequate? | Yes | No | | | | |
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14. How long did it take you to complete this course? _____
15. What additional dental continuing education topics would you like to see? _____

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| 10. (A) (B) (C) (D) | 25. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 26. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 27. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 29. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |

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