

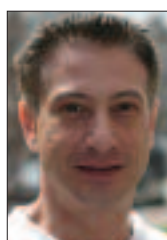
# Methamphetamine Abuse and the Impact on Dental Health



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The abuse of methamphetamine has emerged as an important problem in the United States, and recent evidence has linked the use of methamphetamine to severe dental problems. Drug abusers may seek the help of dentists to manage the dental destruction; in fact, dentists may be the front-line healthcare workers recognizing the oral signs and symptoms of methamphetamine abuse. The term *meth mouth* has been used to describe the deleterious effects of methamphetamine abuse on the dentition. This term, however, is misleading. The rampant caries often seen in patients who abuse methamphetamine may not be due to the drug alone, but rather a confluence of factors including hyposalivation, an increase in consumption of sugar-containing beverages, and poor oral hygiene. A review of methamphetamine abuse is presented. Three clinical cases are described to help dentists recognize and manage the varying presentations observed in patients who are abusing methamphetamine.

Methamphetamine is a highly addictive, central nervous system stimulant developed late in the 19th century.<sup>1,2</sup> The pharmacological properties of methamphetamine were utilized during World War II, as many soldiers were given this medication (eg, Dexedrine [GlaxoSmithKline], Methedrine [Burroughs Wellcome]) to prevent fatigue and increase performance and endurance. Use of the parent drug, amphetamine, as well as the analogue methamphetamine, increased in the postwar years, especially among students and athletes.

In 1959 the FDA banned amphetamine-based inhalers because of their potential for abuse. However, pharmaceutical-grade methamphetamine tablets and capsules were available by prescription. During the 1960s illicit methamphetamine (METH) production and abuse became a social problem in the United States, and in 1970 the FDA (as part of the US Drug Abuse Regulation and Control Act) responded by classifying METH as a Schedule II narcotic with significant potential for abuse.<sup>3,4</sup> More recently, on March 9, 2006, President George W. Bush signed the Patriot Act, which includes important provisions to strengthen federal, state, and local efforts to combat the spread of methamphetamine. In particular, restrictions on the sale of medi-



Figure 1. Patient No. 1, retracted view.



Figure 2. Patient No. 1, maxillary occlusal view.



Figure 3. Patient No. 1, left retracted view.



Figure 4. Patient No. 1, right retracted view.

cines containing some of the progenitor chemicals to produce METH, such as pseudoephedrine, ephedrine, and phenylpropanolamine, must now be placed behind the pharmacy counter, and individuals are required to show identification prior to purchase. Further, purchasers are limited in the amount of these substances that can be purchased from a vendor (9 grams a month and 3.6 grams in a single day).<sup>5</sup>

Illicit METH abuse has received attention in the lay press, dental journals, and Internet Web sites.<sup>6-17</sup> Of specific interest are the reports of devastating effects on oral health, particularly rampant caries. The term *meth mouth* is commonly used to describe frank caries seen in patients with a history of METH abuse, although evidence to date regarding the etiology is anecdotal. The term *meth mouth* is misleading, because the presentation of decay, especially on buccal and smooth surfaces, is also present in patients suffering from generalized, drug-induced

hyposalivation. What differentiates generalized hyposalivation-related dental caries from methamphetamine-related dental destruction is the combination of rampant decay, decreased/nonexistent oral hygiene, and bruxism. Furthermore, the oral presentation of a patient who has a history of METH abuse can vary depending on factors such as length of time using the drug, diet, and level of oral hygiene.

**PHARMACOLOGY OF METHAMPHETAMINE**  
Amphetamine analogues such as methamphetamine have traditionally been administered for the treatment of depression, attention deficit disorder, and narcolepsy, and to promote weight loss.<sup>18,19</sup> Examples of amphetamine analogues currently approved in the United States include dexedrine (Dexedrine) and dexedrine and amphetamine (Adderall [Shire]). Methylphenidate (Ritalin [Novartis]) is a piperidine

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derivative that is structurally related to amphetamine and shares the same pharmaco-

logical properties.<sup>18</sup> The most widely used illicit amphetamine analogues include methylenedioxymethamphetamine (MDMA; ecstasy), methylenedioxyamphetamine (MDA; the

love pill), methylenedioxyethamphetamine (MDEA; Eve), and the illegal production of nonpharmaceutical-grade METH (ice, crystal meth). The federal Drug Enforce-

ment Agency (DEA) currently classifies pharmaceutical-grade METH as a Schedule II stimulant drug. (Schedule II: [A] The drug or other substance has a high potential for abuse; [B] The drug or other substance has a currently accepted medical use in treatment in the United States or a currently accepted medical use with severe restrictions; [C] Abuse of the drug or other substances may lead to severe psychological or physical dependence.)<sup>20</sup>

The amphetamine analogues have similar effects. They can produce hyperalertness, hyperactivity, euphoria, talkativeness, decreased appetite, and increased physical and sexual endurance.<sup>18,19</sup> Mild intoxication can present as dizziness, headache, irritability, hypertension, tachycardia, mydriasis, tremor, hyperpyrexia, and hyperreflexia. Toxic doses of METH are extensions of the effects of mild intoxication and may include confusion, diaphoresis, palpitations, nausea, vomiting, hallucinations, convulsions, and coma.<sup>11,18,21,22</sup>

METH is a rapidly addictive and potent central nervous system stimulant that causes release of norepinephrine and dopamine at the synaptic cleft while also blocking their reuptake.<sup>23</sup> This results in depletion of available neurotransmitters and possibly contributes to rapid tolerance and eventual withdrawal symptoms.<sup>18,21</sup> METH is also structurally related to epinephrine and will cause a rise in both systolic and diastolic blood pressure, usually accompanied by a reflex bradycardia. The respiratory center is also stimulated, causing an increase in both the rate and depth of respiration.<sup>18,24</sup>

METH is an odorless, crystalline white powder that can be snorted, smoked, swallowed, or injected; it can be easily dissolved in water or alcohol. After oral administration the time to maximum plasma concentration ( $T_{max}$ ) is 2 to 3 hours, although onset of effects can be in as little as 20 minutes.<sup>25,26</sup> Illicit METH users typically progress to snorting, smoking, or injecting the drug to decrease onset time;  $T_{max}$  (described as the "rush") for intravenous, snorted, or smoked METH is 2 to 4



Figure 5. Patient No. 2, retracted view.



Figure 6. Patient No. 2, left retracted view.



Figure 7. Patient No. 2, right retracted view.



Figure 8. Patient No. 3, retracted view.



Figure 9. Patient No. 3, left retracted view.



Figure 10. Patient No. 3, right retracted view.

minutes.<sup>25-27</sup>

The liver is primarily responsible for the metabolism of METH. The drug undergoes oxidation and glu-

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Table 1. Methamphetamine Laboratory Incidents and Drug Seizures in 2005, by State.<sup>36</sup>

State	Drug Seizures (Kgs)	METH Lab Incidents
California	1,508.7	468
Texas	970.9	269
Washington	744.4	522
Arizona	669.3	14
Michigan	356.5	341
Georgia	209.5	117
Kansas	123.9	375
Hawaii	91.6	11
New Mexico	64.8	6
Nevada	59.5	52
Mississippi	54.3	184
Oregon	49.7	130
Minnesota	49.6	88
Utah	49.3	50
Florida	37	273
Indiana <sup>1</sup>	35.1	915
Colorado	34.4	149
Pennsylvania	32.6	79
Oklahoma	30.7	217
Iowa	24.6	753
Missou	23.8	2170
Arkansas	22.9	426
Nebraska	22.4	228
North Carolina	16.1	322
Illinois	14.2	931
Virginia	13.5	16
Tennessee	12.6	337
Idaho	11.1	21
New Jersey	10.2	3
Louisiana	8.5	98
Alabama	7.5	5
Alaska	6.9	5
Montana	6.1	25
Kentucky	5.6	227
North Dakota	3.8	159
Ohio	3.6	331
South Carolina	3.4	69
New York	3.2	35
South Dakota	2	16
Wyoming	1.8	9
Connecticut	0.9	3
Maryland	0.7	2
Massachusetts	0.7	3
West Virginia	0.4	48
Delaware	0.2	0
Wisconsin	0.2	55
New Hampshire	0.1	2
Maine	0	5
Rhode Island	0	1
Vermont	0	0

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Figure 11. Patient No. 3, maxillary occlusal view.

ronidation into an active metabolite (amphetamine) and 2 inactive metabolites (norephedrine and p-hydroxynorephedrine). The cytochrome p-450 isoenzyme 2D6 is involved in the oxidation of METH to amphetamine, and drugs that can inhibit or induce this isoenzyme may alter the metabolism, although no changes in clinical effect may be noted.<sup>28,29</sup>

At a normal physiological pH of 6 to 8 the elimination half-life ( $T_{1/2}$ ) is approximately 12 hours and is relatively constant regardless of route of administration.<sup>12,21,25</sup> The elimination half-life of METH varies widely, however, based on the pH of the urine. The rate of diffusion from the renal tubular lumen back into the blood is decreased when a drug is maximally ionized, and increased if the drug is nonionized. As the ionization of a weak base is decreased in an acidic environment, manipulation of the urine pH can potentially enhance renal

excretion, thereby decreasing the elimination half-life of METH. Therefore, it has been suggested that one potential strategy for the treatment of acute overdose is acidification of the urine to increase elimination.<sup>18,25</sup> This practice is not currently recommended, however, due to the risk of developing rhabdomyolysis and renal failure.<sup>30</sup>

Currently, the only effective treatment for METH abuse involves behavioral therapies such as cognitive behavioral and contingency management interventions.<sup>31</sup> Detoxification is only the first step toward recovery from METH addiction; typically patients are involved with educational programs, individualized counseling with drug testing, and support networks. Several emerging drug therapies are aimed at mitigating the clinical or addictive effects of METH. Drugs such as bupropion (Wellbutrin [GlaxoSmithKline]), modafinil (Provigil [Cephalon]), and

baclofen (Lioresal [Novartis]) may have utility in the treatment of METH dependence.<sup>32,33</sup>

### UNITED STATES METH ABUSE STATISTICS

METH abuse in the United States is reported to be widespread throughout the Pacific, Southwest, and West Central regions, and is rampant in prison populations.<sup>6-9,22,34,35</sup> From 2002 to 2005, persons from the West were twice as likely to have used METH in the past year compared to any other region in the United States, although evidence suggests the problem may be spreading eastward.<sup>34</sup> According to the DEA, in 2005 the states with the highest METH lab incidents and drug seizures were California (468 incidents; 1,509 kg seized), Texas (269 incidents; 971 kg seized), Washington (522 incidents; 744 kg seized), and Missouri (2,170 incidents; 24 kg seized).<sup>36</sup> Table 1 presents data from all states regarding drug seizures and METH laboratory incidents in 2005.

The National Survey on Drug Use and Health (NSDUH) reported that in 2005 an estimated 10.4 million people age 12 or older had tried METH, and 0.5% of Americans age 12 and older (1.3 million people) had tried METH once in the past year (down from 0.6% in 2004). Also, initiation of METH use, defined as persons who used METH for the first time in the past 12 months, is decreasing among people 12 years and older.<sup>34</sup> Unfortunately, another survey by the CDC found that 9.8% of high school students had used METH within their lifetime.<sup>35</sup>

Street names for METH differ by region but include

the following: ice, speed, fire, crank, chalk, crystal meth, glass, Ozs, shabu, stove top, and poor man's cocaine.<sup>22,37</sup> Illegal METH is produced by several methods utilizing ingredients such as these: ephedrine or pseudoephedrine, hydrochloric acid, iodine, ether, lye, chloroform, Freon, Drano, lighter fluid, lantern fuel, rock salt, dry ice, battery acid, red phosphorus, and propane.<sup>13,15</sup> Because many of these chemicals are highly toxic and volatile, 15% of all clandestine METH labs are discovered as a result of an explosion or fire.<sup>38</sup>

The byproduct of METH manufacturing is 6 pounds of toxic waste for each pound of product.<sup>13,27</sup> In many cases the remnants, waste products, and facilities involved with the production of METH are abandoned after use, or flushed down the drain. Dwellings where METH labs have been discovered are often condemned and slated for destruction because the process of METH production renders the dwelling uninhabitable and a health risk for future occupants. According to the DEA in 2001, 10 pounds of METH can be produced in a 24-hour period, with each pound being sold for \$3,500 to \$25,000 (\$20 to \$330 per gram). A chronic METH user on a "binge" may consume 8 to 12 grams in a single day.<sup>22</sup>

### ORAL HEALTH CONSIDERATIONS

The primary dental complaint of patients with a history of METH abuse is xerostomia.<sup>39,40</sup> METH increases sympathetic activity in the central nervous system, causing a reduction in saliva secretion by stimulation of inhibitory alpha-2 receptors, resulting in reductions in unstimulated salivary flow.<sup>41,42</sup> The patient's sensation of dryness is exacerbated by the high protein content in the remaining saliva.<sup>41</sup> METH abusers are hyperactive and rarely stop to eat or drink during times of active drug use. As a result, METH abusers may experience generalized dehydration due to a decline/cessation in food and water intake, coupled with the hypermetabolic effects of the drug. Of particular concern for dentists is that

METH abusers report craving sugar, and they typically drink large quantities of nondiet soft drinks high in carbohydrates; Mountain Dew is commonly mentioned as a favored beverage.<sup>7,15</sup>

Without the protective buffering effects of saliva, caries development in a METH patient is widespread. Typically, decay is seen on the facial and cervical surfaces of both the maxillary and mandibular teeth, with progression to eventually involve the entire clinical crown. Unlike other forms of caries caused by drug-induced or post-radiation-induced xerostomia, caries seen in a METH patient seems to progress slowly.<sup>11</sup>

The clinical presentation of a METH patient may vary. During the days or weeks of a "binge," METH abusers may not practice any oral hygiene. This may be followed by times of METH abstinence when decay progression can be slowed by oral hygiene measures. The cyclical nature of oral hygiene practices may in part slow the rate at which caries worsens. Other factors that influence the rate of disease progression are the amount of time the patient abuses the drug and the diet during times of active drug use.

The acidic nature of the ingredients used to produce METH has also been implicated as a causative factor for the caries and tooth wear seen in patients.<sup>10,15</sup> METH can contain phosphoric, sulfuric, or muriatic acid, and smoking it will expose the teeth to acid, contributing to enamel erosion. However, in a study by Navarro, et al, high levels of MDMA (ie, ecstasy, which is structurally related to METH) were detected in saliva, yet were associated with a decrease in salivary pH from 7.4 to only 6.9. Because the critical pH at which enamel demineralizes is 5.5, the pH change after ingestion of MDMA was negligible and not sufficient to induce demineralization and caries formation.<sup>24</sup>

Tooth wear seen in dental patients with a history of METH abuse can result from increased bruxism. METH patients may be hyperactive during times of intense drug use, and as the drug begins to wear off users can begin "tweak-

Table 2. What You Can Do If You Suspect a Patient May Be Using Methamphetamine.<sup>14</sup>

- Complete a comprehensive oral examination that includes taking a thorough dental and medical history.
- Attempt to educate the patient about the profound negative effects the drug can have on oral health.
- Refer the patient to appropriate resources such as a physician or drug counseling service.
- Use preventive measures such as topical fluorides.
- Encourage the patient to drink water instead of sugar-containing carbonated beverages.
- Be cautious when administering local anesthetics, sedatives, general anesthesia, or nitrous oxide, or prescribing narcotics because of potential drug interaction.
- Take opportunities to educate patients about the risks associated with methamphetamine or any illicit drug use.

ing,” a feeling characterized by restless anxiety, irritability, fatigue, and dysphoria.<sup>27</sup> During this time, METH abusers have a tendency to grind and clench their jaws, further contributing to tooth attrition.<sup>43</sup>

**DENTAL CONSIDERATIONS**

Dentists should consider the potential of METH abuse in patients who report xerostomia, unexplained rampant caries, and accelerated tooth wear from bruxism. The first step is to complete a thorough medical history, including questions of illicit drug use. Although patients are sometimes hesitant to disclose a history of illicit drug use to their dentists,<sup>44</sup> if METH abuse is confirmed, the dentist should encourage the patient to consider consultation with both their physician and a substance abuse rehabilitation facility (Table 2).<sup>16</sup>

Whenever possible, all elective dental treatment should be postponed if the patient is suspected of actively using METH. If dental treatment must be provided to a patient who has recently used METH, the dentist must be careful when administering local anesthesia containing a vasoconstrictor. The duration of action for METH can be 8 to 12 hours and up to 24 hours in cases of heavy use.<sup>18,19,22,27,45</sup> If local anesthesia must be administered during this time, a plain, local anesthetic solution without vasoconstrictor should be used. In addition, the use of a local anesthetic containing a vasoconstrictor should be avoided for 24 hours following the last METH use. This is to allow the drug to be cleared from the patient’s system. Although METH may be only 75% eliminated after a 24-hour period, there is evidence suggesting that the cardiovascular and clinical effects cease before the drug has been fully eliminated.<sup>46</sup>

Postoperative medications such as opioid analgesics or drugs with abuse potential should be avoided in someone already at risk for such tendencies. In addition, medication that may cause central nervous system depression should be avoided to minimize the potential for ventilatory depression.<sup>14,21,47</sup>

Additional preventive measures for patients with a history of METH abuse include stimulating saliva flow and fluoride supplementation. Pharmacologic agents to im-

prove salivary flow have been reported to be more effective than salivary substitutes.<sup>48</sup> The 2 most common systemic agents available by prescription are the secretagogues

pilocarpine HCL (Salagen [MGI Pharma]) and cevimeline HCL (Evoxac [Daiichi-Sankyo]), both of which are believed to act on the muscarinic receptors in the salivary glands.<sup>49</sup>

Because multiple daily doses are required with both of the above medications and compliance is essential to improve symptoms, a simpler

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method to improve salivary flow is encouraging the patient to chew sugarless gum.<sup>11,42</sup>

Fluoride should be administered via trays, gels, rinses, or varnishes in addition to a review of basic oral hygiene practices. A neutral fluoride rather than an acidulated product is to be used in patients reporting xerostomia, to buffer the pH and to help prevent caries formation and progression. Sodium fluoride 1.1% is recommended (eg, PreviDent 5000 Plus [Colgate-Palmolive]).

Practitioners should counsel patients with a history of METH abuse to avoid carbohydrate-rich soft drinks, and instead to drink water. Although the effectiveness of the commercially available oral moisturizers such as Optimoist (Colgate-Palmolive) have yet to be validated in this patient population, the medication has shown improvement of salivary flow rates in other xerostomic populations.<sup>50</sup> The Biotene product lines are also worth consideration for a METH patient complaining of xerostomia (Dry Mouth Toothpaste, Gentle Mouthwash, Dry Mouth Gum, and Oral Balance Gel [Laclede]). A study has shown marked, subjective improvement in patients with clinical xerostomia related to head and neck irradiation.<sup>51</sup>

If the dentist feels that the patient is no longer abusing METH, then there are no treatment limitations. This decision should follow a candid discussion about the history of METH use and its effects on oral health. Often, patients who are recovered from METH are ashamed of the condition of their teeth, and restoring their appearance will help them regain self-esteem.<sup>52</sup>

### CASE EXAMPLES

Patient No. 1 is a 32-year-old male with a 4-year history of METH abuse (Figures 1 to 4). He presented for restoration of his smile following his recovery. He reported no pain at initial presentation. During times of active drug use he consumed upwards of 12, 16-ounce, nondiet cola drinks per day. He did not practice

oral hygiene during the time he was using METH.

Patient No. 2 is a 21-year-old male with a 1-year history of METH abuse (Figures 5 to 7). He presented for routine dentistry following a 5-year absence from care. He reported no pain at initial presentation and has not used METH for 1 year. He reported drinking "several" nondiet cola drinks per day, and only occasionally practiced oral hygiene during active drug use.

Patient No. 3 is a 42-year-old male with a 3-year history of METH abuse (Figures 8 to 11). What follows is a firsthand account of this patient's story.

*I was introduced to crystal methamphetamine at a social occasion made up of young professionals about 9 years ago. Up until that time I had no history of drug use of any kind. Shocked by how casual and open everyone was about using it, I rationalized that it must not be a "bad" drug, and I decided to try it. Immediately, the effects of the drug seduced me. The energy it gave me and the level to which it boosted my confidence impressed me. I used the drug socially on weekends for the next year or so without any negative effects on my teeth before stopping for several years.*

*When I was reintroduced to METH a couple years later, I "snorted" it primarily on the weekends. As my addiction progressed, I began to smoke the drug, and my habit became a daily one. I began experiencing negative side effects such as sleep deprivation, weight loss, and problems with my oral health.*

*Because of METH, I did not want to eat or drink anything; I would sometimes go days without eating any solid foods, and drank very little liquid. Every 4 to 5 days I would eat and drink because I was so run down and needed to provide my body with nutrients. After that I would try to get a few hours of sleep. It also causes a condition called dry mouth, which I suffered from. I began having problems such as bleeding gums, teeth grinding, and ulcers under my tongue. As the addiction worsened, practicing*

*oral hygiene became less and less a priority. I no longer flossed or visited the dentist as I had in the past. Brushing had become a once-a-day practice.*

*At the very lowest point of my addiction I began to shoot METH or was "slamming" it, as it is commonly referred to. I did it this way at least twice a day for a period of 8 months. This is when the deterioration of my oral health was the worst. I had problems with teeth breaking at the gumline and the most severe toothaches I had ever encountered. When the pain was unbearable I would visit the dentist only to have an emergency root canal to ease the pain, but never followed up with him to have the rest of the work done. Finally, as a blessing in disguise, I was incarcerated, and my addiction ended. I credit this with saving my life.*

*Today, I still suffer from the effects of my METH use in terms of my oral health. Even though I am clean and sober from the drug for over 3 years, the repercussions of it still linger. I have lost several teeth and need to have a few broken ones extracted. I pray going forward that there will be no more issues with my oral health, but I believe it is something only time will tell.*

### CONCLUSIONS

METH abuse in the United States has grown due to its appeal, ease of manufacture, and low cost. Users rapidly become addicted and develop a tolerance that then requires a larger dose to achieve the same "high." This creates a pattern of abuse that is cyclical and self-sustaining. The result of METH abuse on a patient's oral health involves the triad of xerostomia secondary to sympathetic central nervous system activation, rampant caries caused by a high sugar intake in the absence of saliva, and bruxism resulting from hyperactivity. Dentists may be the front-line healthcare workers recognizing the oral signs and symptoms of methamphetamine abuse. While potential treatment options exist, too often the only dental treatment possible for METH users is extraction, leading to what one report called, "a

young generation of denture wearers."<sup>9</sup> This paper has reviewed the current body of knowledge of METH abuse with a focus on the variety of negative dental sequelae as demonstrated by 3 clinical cases. ♦

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## Continuing Education Test No. 89.2



To submit Continuing Education answers, use the answer sheet on page 119. On the answer sheet, identify the article (this one is Test 89.2), place an X in the box corresponding to the answer you believe is correct, detach the answer sheet from the magazine, and mail to Dentistry Today Department of Continuing Education.

The following 8 questions were derived from the article *Methamphetamine Abuse and the Impact on Dental Health* by Jason H. Goodchild, DMD, et al on pages 124 through 131.

### Learning Objectives

After reading this article, the individual will learn:

- to identify the dental implications of methamphetamine use and the dentist's role in treating the methamphetamine user, and
- the mechanisms by which methamphetamine impacts dental health.

- Methamphetamine is a potent central nervous system stimulant. It is easy and inexpensive to synthesize (produce).**
  - Both statements are true.
  - The first statement is true; the second is false.
  - The first statement is false; the second is true.
  - Both statements are false.
- The National Survey on Drug Use and Health (NSDUH) reported that \_\_\_% of the American population over the age of 12 is estimated to have used METH at least once in the prior year.**
  - 2.4
  - 5.6
  - 10.4
  - 15.1
- The most important oral manifestation of methamphetamine use is \_\_\_.**
  - tooth loss
  - gingival enlargement
  - xerostomia
  - tooth fracture
- Excessive tooth wear in methamphetamine users has been reported in association with \_\_\_.**
  - drug-induced clenching
  - the corrosive effect of carbonated drinks
  - the lack of lubrication in a dry mouth
  - all of the above
- If the dentist feels that the patient is no longer abusing METH, the following treatment limitations still apply:**
  - endodontics
  - veneers
  - implants
  - none of the above
- The primary dental complaint of patients with a history of METH abuse is \_\_\_.**
  - pain
  - osteonecrosis
  - dry mouth
  - clenching
- Whenever possible, all elective dental treatment should be postponed if the patient is suspected of actively using METH. If local anesthesia must be administered, the best agent would be \_\_\_.**
  - xylocaine 2% with 1:100,000 epinephrine
  - xylocaine 2% with 1:50,000 epinephrine
  - Marcaine 0.5% with 1:200,000 epinephrine
  - prilocaine 4%
- Preventive measures for patients with a history of METH abuse include all of the following EXCEPT \_\_\_.**
  - fluoride supplementation
  - avoidance of opioids postoperatively
  - encouraging carbohydrate-rich soft drinks
  - stimulating saliva flow



CE ARTICLES  
COMING IN JUNE 2007

Howard E. Strassler, DMD, et al...*Fiber Reinforcement for One-Visit Single-Tooth Replacement Adhesive Fixed Partial Dentures*

Maria C. Ferriol, DMD, et al...*Oral Mini-Implants to Facilitate Orthodontic Movement of Teeth*

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