

Stimulants of Abuse and Oral Health

Stimulants, also referred to as psychostimulants, are psychoactive drugs that induce temporary improvements in either mental or physical functions. Stimulants are widely used throughout the world as prescription medications and as performance-enhancing or recreational/illicit drugs. Examples of stimulants are methamphetamine (MA), methylenedioxymethamphetamine (Ecstasy), levoamphetamine / dextroamphetamine (Adderall[®]), methylphenidate (Ritalin[®]), and cocaine.

Amphetamine analogues, including methamphetamine, are synthesized by attaching a substituent (methoxy-, methyl-, halogen, or sulfur) to different positions on the phenyl ring of an amphetamine.¹ They have been used to treat depression, attention deficit disorder, and narcolepsy, and to promote weight loss.² According to national household surveys, the annual prevalence is 1.4% for “stimulants” in the United States.³

Stimulants share the following oral manifestations:

- xerostomia
- hyposmia
- sinusitis
- dysgeusia
- sialadenitis
- stomatitis
- gingivitis
- glossitis
- discolored tongue
- bruxism
- dysphagia

Methamphetamine

Methamphetamine abusers (MA) demonstrate bruxism, excessive tooth wear, xerostomia, and rampant caries. Patients may describe their teeth as blackened, stained, rotting, or crumbling, or may say their teeth are “falling apart.” There is a distinct pattern of caries on buccal and cervical smooth tooth surfaces and proximal surfaces of the anterior teeth.⁴

This pattern of MA-associated dental disease was initially described by Richards and Brofeldt, and has acquired the moniker “meth mouth.”⁵ This moniker began to seep into public awareness because of extensive, and sometimes sensational, media coverage. The initial articles shared a common theme:

methamphetamine use leads to devastating effects on health, particularly oral health. “Meth mouth” is now commonly used to describe the numerous dental problems seen in some methamphetamine abusers, although evidence on its etiology is anecdotal. “Meth mouth” may be a misnomer because the presentation of decay (e.g., buccal surfaces, smooth surfaces) is indicative of generalized drug-induced xerostomia.⁶ Rampant decay, decreased or nonexistent oral hygiene, and bruxism differentiate “xerostomia-related destruction” from “methamphetamine-related destruction.”⁷

The sympathomimetic effects of chronic methamphetamine abuse may lead to dry mouth and extensive bruxism, increasing the risk for caries, periodontal lesions, and tooth wear. Furthermore, a significant decline of salivary buffering capacity in methamphetamine abusers may trigger the risk for dental erosions. Methamphetamine abusers and practitioners should be aware of these symptoms.⁶

The overall US prevalence of current methamphetamine use is estimated to be 0.27%. The lifetime use (incidence) is estimated to be 8.6%.⁸

MDMA

Methylenedioxymethamphetamine (MDMA), more commonly known as “Ecstasy,” is a widely used recreational drug. The first synthesis of MDMA was by Köllisch in 1912 at a German pharmaceutical company, Merck and Company. At the time of his patent application, no use was specified for MDMA, and it was called “methylosafrylamin.”⁹

MDMA can result in several oral complications including dry mouth, bruxism, and problems associated with malnutrition caused by drug-induced anorexia. Chewing, grinding, and temporomandibular joint tenderness are frequently reported by MDMA users. MDMA-induced tooth wear attributed to grinding and clenching is more common on occlusal surfaces of posterior teeth rather than on incisal edges. Tooth wear in Ecstasy users is especially severe for mandibular first molars. This distribution of tooth wear suggests that it is caused by jaw clenching rather than by tooth grinding. High intake of carbonated drinks, to overcome the sensation of dry mouth after drug use, may lead to dental caries and erosion. Topical use of Ecstasy may result in oral-tissue necrosis and mucosal fenestration.⁴ Most documented oral effects of Ecstasy are case reports, although the relation with xerostomia and bruxism has been investigated more systematically.

ADHD medications

Methylphenidate (Ritalin[®], Concerta[®], Focalin[®], and Metadate[®]) and amphetamines (Adderall[®], Dexedrine[®]) are stimulants commonly prescribed for attention-deficit hyperactivity disorder (ADHD). Methylphenidate was introduced in 1956 by CIBA (Company for Chemical Industry Basel) for treating what was then known as hyperactivity.¹⁰ Medications can help decrease ADHD symptoms in children

and adults. Although technically not an amphetamine, methylphenidate is classified as a stimulant. It is also one of the most-abused drugs in the US.

ADHD is the most common neurobehavioral disorder of childhood. Using the DSM-IV criteria, ADHD demonstrates a prevalence of 11 to 16%. ADHD is much more common in boys than girls, at a ratio of 4:1. It is diagnosed by the presence of observed behaviors in multiple settings.¹¹ Treatment approaches can vary between children and adults, and not every person with ADHD takes the same drugs.¹²

Ritalin® is the most commonly prescribed medication and often the first course medication for ADHD. This class of drugs is often referred to as central nervous system stimulant medications. They work by increasing the amounts of dopamine and norepinephrine in the brain. This effect improves concentration and decreases the fatigue common with ADHD.¹²

One study indicated that children with ADHD are twelve times more likely to have a higher Decayed-Missing-Filled Teeth index than non-ADHD children.¹³ Side effects of medication, particularly xerostomia, reduce saliva's buffering capacity, leading to an increased risk of decay. Finally, those experiencing xerostomia often turn to consumption of soft drinks to alleviate the dry mouth.¹⁴

The US annual prevalence of the non-medical use of ADHD medications among 8th, 10th, and 12th graders has averaged 2.7%, 4.3%, and 4.5%, respectively. The use among college students has averaged 5.0%.¹⁵

Cocaine

Cocaine (benzoylmethylecgonine) is derived from the leaves of *Erythroxylon coca*. The main method of administration is snorting the cocaine powder. Within a few minutes after inhalation, a euphoric high feeling lasting for 20 to 90 minutes occurs. For smoking of cocaine, the cocaine powder must first be converted into a smokeable form (e.g., by utilizing sodium bicarbonate).

More than half of the people who snort cocaine have recurrent epistaxis, intranasal crusting, rhinitis, and chronic sinusitis.¹⁶ Nasal septum perforation is a frequently reported complication, observed in approximately 5% of cocaine snorters.¹⁷ Chronic use of cocaine seems to have similar effects on the palate. Since 1989, at least 45 cases of cocaine-induced oronasal perforations have been reported in the literature,¹⁸ suggesting that this complication is much more common than previously thought.¹⁹

The US prevalence of cocaine abuse is about 0.6% of the population aged 12 years and older; 0.1% are current users of crack cocaine.²⁰



In conclusion, stimulant use causes xerostomia secondary to sympathetic central nervous system activation, rampant caries caused by high-sugar intake in the absence of protective saliva, and bruxism as a result of hyperactivity. It is the position of the American College of Prosthodontists that practitioners should know how to recognize the signs of stimulant abuse and manage the oral health of patients with a history of stimulant use.

References

1. Hoffman BB: Catecholamines, sympathomimetic drugs, and adrenergic receptor antagonists. In Hardman JG, Limbird LE, (eds): Goodman and Gilman's the Pharmacological Basis of Therapeutics (ed 10). New York, McGraw-Hill, 2001, pp 215-260
2. Lacey CF, Goldman MP, Lanci LL, et al: Drug Information Handbook (ed 13). Hudson, OH, Lexi-Comp, 2005, pp 971-972
3. Maxwell JC, Rutkowski BA: The prevalence of methamphetamine and amphetamine abuse in North America: a review of the indicators, 1992-2007. *Drug Alcohol Rev* 2008;27:229-235
4. Shekarchizadeh H, Khami MR, Mohebbi SZ, et al: Oral health of drug abusers: A review of health effects and care. *Iran J Public Health* 2013;42:929-940
5. Richards JR, Brofeldt BT: Patterns of tooth wear associated with methamphetamine use. *J Periodontol* 2000;71:1371-1374
6. Rommel N, Rohleder NH, Koerdt S, et al: Sympathomimetic effects of chronic methamphetamine abuse on oral health: A cross-sectional study. *BMC Oral Health* 2016;16:59
7. Donalson M, Godchild JH: Oral health of the methamphetamine abuser. *Am J Health-Syst Pharm* 2006;63:2078-2082
8. Durell TM, Kroutil LA, Crits-Christoph P, et al: Prevalence of nonmedical methamphetamine use in the United States. *Subst Abuse Treat Prev Policy* 2008;3:19
9. Hahn I, Tarabar A: MDMA toxicity, Available online at <http://emedicine.medscape.com/article/821572-overview>. Accessed July 28, 2016
10. Ritalin: ADHD medication FAQ. Available online at <http://www.additudemag.com/adhd-web/article/4996.html>. Accessed July 28, 2016
11. Bimstein E, Wilson J, Guelmann M, et al: Oral characteristics of children with attention-deficit hyperactivity disorder. *Spec Care Dentist* 2008;28:107-110



References cont.

12. Cheney K: Treating attention deficit hyperactivity disorder. ADHD Medications List. Available online at <http://www.healthline.com/health/adhd/medication-list>. Accessed August 10, 2016
13. Hidas A, Noy AF, Birman N, et al: Oral health status, salivary flow rate and salivary quality in children, adolescents and young adults with ADHD. Arch Oral Biol 2011;56:1137-1141
14. Broadbent JM, Ayers KM, Thomson WM: Is attention-deficit hyperactivity disorder a risk factor for dental caries? A case-control study. Caries Res 2004;38:29-33
15. Sussman S, Pentz MA, Spruijt-Metz D, et al: Misuse of "study drugs": prevalence, consequences, and implications for policy. Subst Abuse Treat Prev Policy 2006;1:15
16. Blanksma CJ, Brand HS: Cocaine abuse: orofacial manifestations and implications for dental treatment. Int Dent J 2005;55:365-369
17. Mari A, Arranz C, Gimeno X, et al: Nasal cocaine abuse and centropalatal destructive process: report of three cases including treatment. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002;93:435-439
18. Bains MK, Hosseini-Ardehali M: Palatal perforations: past and present. Two case reports and a literature review. Br Dent J 2005;199:267-269
19. Brand HS, Gonggrijp S, Blanksma CJ: Cocaine and oral health. Brit Dent J 2008;204:365-369
20. Johnston LD, O'Malley PM, Bachman JG, et al: Monitoring the future national survey results on drug use, 1975–2013: Volume I, Secondary school students. Ann Arbor, Institute for Social Research, The University of Michigan, 2014, pp 154-155. Available online at http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2013.pdf. Accessed July 15, 2016

Authors

Stephen A. Wagner, DDS, FACP
Jon D. Wagner, MD, DDS, FACS

Date

Approved ACP Board of Directors: October 4, 2016