Methamphetamine Case Study

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INTRODUCTION

Methamphetamine use is a growing drug-abuse problem in the United States with the National Institute for Drug Abuse reporting that nearly 12 million Americans have tried methamphetamine. Methamphetamine is a very addictive stimulant drug that activates certain systems in the brain. It is chemically related to amphetamine but, at comparable doses, the effects of methamphetamine are much more potent, longer lasting, and more harmful to the cardiovascular and central nervous systems.

Methamphetamine increases the release of very high levels of the neurotransmitter dopamine, which stimulates brain cells, enhancing mood and body movement. Taking even small amounts of methamphetamine can result in increased wakefulness, increased physical activity, decreased appetite, increased respiration, rapid heart rate, irregular heartbeat, increased blood pressure, and hyperthermia. Other effects of methamphetamine abuse may include irritability, anxiety, insomnia, confusion, tremors, convulsions, and cardiovascular collapse and death. Long-term effects may include paranoia, aggressiveness, extreme anorexia, memory loss, visual and auditory hallucinations, delusions, and severe dental problems.

Though the full effect of methamphetamine on the cardiovascular system has not been thoroughly described in the literature, several case reports and small-scale studies have been published.

CASE PRESENTATION

- 43 y/o female patient presents to Urgent Care complaining of three-to-four week history of shortness of breath, fatigue, “restlessness” at night and chest “pressure” that has been unrelenting for the past 12 hours.

PMH
- Denies any previous medical history, is on no regular medications

SOCIAL HISTORY
- Divorced, had 2 grown children locally. Works for the county as an EMS dispatcher. Smokes 1ppd (25-30 pack-year). Denies alcohol. Uses oral methamphetamine daily
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(usually twice a day) for the past 1 ½ years. Admits to cocaine use “once or twice” several years ago.

FAMILY HISTORY
- Father has history of alcohol abuse and questionably HTN, otherwise negative.

CARDIOVASCULAR RISK
- Smoker
- Hypertensive (on presentation—no history)

PHYSICAL EXAM
- Anxious/nervous appearing, obviously short of breath
- VS: BP 172/120; HR 120; RR 24; Temp 99.9; O2 Sat 97%;? WT
- HEENT: PEERL, Conjunctiva Pink/Moist; Lips dry/cracked
- NECK: JVP ~ 10 cm with clear hepato-jugular reflux. No Bruit
- LUNGS: Good inspiratory effort with bi-basilar “crackles”
- CV: RRR, HR 118, no S3 described, no murmur
- ABD: no hepatomegaly; no fluid wave
- EXT: 1+ pre-tibial edema
- SKIN: good turgor

DIAGNOSTICS & LABS
- Na 139, K+ 4.1, CL 107, Glucose 105, BUN 10, CR 1.0
- TSH 1.05
- BNP 1782
- Troponin < 0.2, CKMB 1.5
- UDS (drugs of abuse screen): positive for amphetamine and benzodiazepines
- EKG: Sinus Tachycardia, normal axis/intervals, occasional PVCs
- ECHO: Normal Left Ventricle size, but severely decreased LV systolic function with EF 15-20%

HOSPITAL COURSE:
- Admitted from urgent care to the cardiovascular care unit for evaluation. Cardiac enzymes were cycled, and she ruled-out for an acute coronary syndrome. Echocardiogram was done on Day 1. She underwent diuresis with furosemide infusion and was asymptomatic by end of Day 2. ACE-Inhibitor and Beta-Blocker therapies were started using lisinopril and carvedilol.
- Day 3 patient was clinically opti-volemic. Heart Failure Management Program evaluated patient. Aldosterone Antagonist therapy started with spironolactone. HF
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education was started, and included discussion of methamphetamine as cause of her cardiomyopathy. HF nutrition counseling provided by registered dietician. Psychiatric/Addictions care also evaluated patient. She refused
- Inpatient and outpatient addictions treatment.
- Day 4 discharge to home in care of her son. To follow up in the Heart Failure Clinic in four days.

OP HF CLINIC FOLLOW UP-1
- Patient seen four days post-discharge feeling much better and compliant with medications. No methamphetamine and no cigarettes since hospital admission.
- Counseling by HF NP, Clinical Pharmacist and Registered Dietician.
- Medications: carvedilol, lisinopril, furosemide, spironolactone, and lexapro.
- Carvedilol up-titrated to 6.25 mg BID
- Chemistry panel: NA 137, K+ 4.1, BUN 18, CR 1.1
- BNP: 594
- Non-invasive impedance cardiography (BioZ): Increased vascular resistance (2044), reduced cardiac output (3.3), reduced stroke index (25).
- Patient again refused outpatient addictions counseling, agrees to weekly follow-up with HF clinic.

SUBSEQUENT HFC FOLLOW UP
- Patient seen weekly for next 6 weeks.
- Carvedilol titrated to 25 mg BID
- Furosemide decreased to 40 mg daily over time
- Remained abstinent from methamphetamine (UDS negative), but started smoking again after about 8 weeks.
- Three months after HFC therapy was initiated, the ECHO was repeated:
  - LV systolic function NORMAL. EF 72%
- Two months after the echocardiogram, patient failed follow up with HFC.
- She did return for one visit at which she admitted that she used methamphetamine one time in the previous week after the death of her grandmother. She again refused addictions treatment/counseling.
- She has not returned to HFC since that visit.
- Multiple attempts have been made to locate/contact patient via telephone and mail. She has moved and all of her emergency contacts claim to not know her whereabouts.

DISCUSSION
- Methamphetamine (and cocaine) use should be considered any time a young person...
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- Refusal to participate in clinical addictions recovery and counseling programs is common in drug-addicted persons.
- Several studies have documented adverse effects of beta-blockade in patients with ongoing cocaine or amphetamine use. The hazard lies in the potential for deadly ventricular arrhythmias with unopposed beta-blockade concomitantly with amphetamine agents. Though no large-scale, randomized studies exist, the use of an alpha & beta-blocking agent (such as carvedilol) is widely felt to reduce the potential for adverse cardiac events in this population.
- Methamphetamine-induced cardiomyopathy can very often be successfully treated with significant improvement in systolic function with a combination of abstinence from the drug and a medication regimen of beta-blocker, ACE-inhibitor, and aldosterone antagonist.
- However the disease of addiction cannot be ignored. The potential for relapse is great. As addictions research has shown, drug-addicted persons are at risk of stopping therapeutic medication regimens, relapse, and poor follow-up habits.
REFERENCES

1. National Survey on Drug Use and Health - SAMHSA web site.