

CASE REPORT

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Fentanyl Patches Left on Dead Bodies—Potential Source of Drug for Abusers

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ABSTRACT: We report a fatal case of fentanyl poisoning in which the decedent apparently obtained the drug from a used transdermal patch removed from a deceased nursing home patient. Fentanyl drug patches, even those previously used, contain a potentially lethal amount of this potent narcotic analgesic and provide a source of fentanyl for drug abusers. This case demonstrates the importance of proper disposal of these drug patches and the need for strict policies and guidelines in patient care settings regarding their disposal. Since fentanyl derivatives may not be detected on routine toxicologic analysis, specific assays should be utilized for the detection of fentanyl in cases of suspected drug overdose.

KEYWORDS: forensic science, fentanyl, drug abuse, transdermal, death

Fentanyl is a potent synthetic narcotic analgesic that is used as a general anesthetic and for the control of acute and chronic pain (1,2). It may be administered either intravenously, intramuscularly, or transdermally. As with other narcotics, fentanyl has considerable potential for abuse and carries a significant risk of adverse reactions that may be fatal. We report a case of a funeral home employee who died from fentanyl poisoning after apparently obtaining the drug from a patch removed from a decedent at the funeral home. Because of the large amount of drug contained within the patch, there are potentially lethal levels of the drug remaining in the patch even when it has been previously used. The importance of proper disposal of these patches must be appreciated in order to prevent future accidental deaths from their improper use.

Case Report

J.G. was a 31-year-old white male who had gone fishing with his employer's son at about 10:45 AM. Approximately two and a half hours later, the decedent reportedly fell to his knees alongside the pond and complained of feeling dizzy, nauseated and weak. He then collapsed and the young boy summoned assistance. Upon arrival, the EMS found him prone on the ground with snoring respirations, tachycardia and a blood pressure of 210/110. He developed cyanosis of the face and extremities with a respiratory

rate of about 2/min. He progressed to full cardiac arrest and aggressive attempts at resuscitation were unsuccessful. Postmortem examination revealed no evidence of significant underlying natural disease or traumatic injury. Toxicologic studies of postmortem blood revealed the following: fentanyl 15 ng/mL (by GC/MS), lidocaine 2.0 mg/L, and trace amounts of propoxyphene and nor-propoxyphene. Toxicologic tests for cocaine, morphine, other organic bases, ethanol and other volatiles were negative. The cause of death was determined to be fentanyl poisoning.

The decedent was employed by a local funeral home and reportedly had a history of drug abuse. On the day prior to his death, he was in contact with an elderly nursing home patient with terminal cancer who was prescribed transdermal fentanyl for pain control. At the time of her death, she was wearing 75 μ g/h and 100 μ g/h fentanyl transdermal patches, both of which had been placed on her the previous day. As is the case with many medical facilities (11) the nursing home did not have a policy concerning the disposal of used fentanyl drug patches. The patches that had presumably been on the body when it was released from the nursing home have never been found. The decedent had no other known access to this drug, so it is our belief that he removed the drug patches from the woman's body. Because it was not witnessed, the exact route of administration of the drug is not known.

Discussion

Fentanyl is a synthetic narcotic analgesic that is 50–100 times more potent than injectable morphine (3). A transdermal route of fentanyl administration (Duragesic®) has been developed and approved for use in the management of acute and chronic pain. The transdermal therapeutic system (TTS) fentanyl allows for continuous rate-controlled systemic delivery of fentanyl base for up to 72 h (4). The fentanyl transdermal system (Duragesic) is composed of four functional layers that are as follows: 1) an outer backing layer of polyester film, 2) a drug reservoir of fentanyl base and alcohol USP gelled with hydroxyethyl cellulose, 3) an ethylene-vinyl acetate copolymer membrane, and 4) an inner fentanyl containing silicone adhesive (5). The drug patches are available in four dosage strengths—25, 50, 75 and 100 μ g/h. These systems contain 2.5, 5, 7.5, and 10 mg of fentanyl, respectively. Following placement of the transdermal patch, the fentanyl base is absorbed into the skin, forming a depot of the drug in the upper layers of the skin. Serum fentanyl concentrations become detectable about two hours after placement of the transdermal

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system (2). This is followed by continuous sustained systemic release of the drug for 72 h. It is recommended by the manufacturers that doses greater than 25 $\mu\text{g}/\text{h}$ not be used initially on non-opioid tolerant individuals because of the potential for serious adverse effects, particularly life-threatening hypoventilation. The minimum effective analgesic serum concentration of fentanyl in non-opioid tolerant individuals ranges from 0.2 to 1.2 ng/mL, with the risk of hypoventilation increasing at serum fentanyl concentrations greater than 2 ng/mL (5). Patients who develop adverse reactions should be monitored for at least 12 h following removal of the patch, because the drug continues to be absorbed from the depot in the skin. The serum fentanyl level declines gradually with a half-life of about 17 h following removal of the transdermal drug system.

Abuse of fentanyl is a recognized problem among medical personnel, illicit drug users and others who gain access to the drug. Fentanyl is the most widely abused drug by anesthesiologists and other health care providers (6). There have been a few regional epidemics of fentanyl-related deaths involving clandestinely manufactured fentanyl and its analogues ("China White") (7). Henderson reported 112 overdose deaths in California that were associated with manufactured fentanyl and its analogs (8). An outbreak of deaths due to 3-methylfentanyl occurred in Allegheny County, Pennsylvania in the late 1980s (9). In 1992, there were 30 cases of fentanyl-related deaths reported in Maryland (10).

Prior to the development of the transdermal route of fentanyl administration, access to fentanyl was predominantly limited to medical personnel and to individuals utilizing clandestinely manufactured fentanyl. There is now a widening pool of individuals with access to this potent narcotic as transdermal fentanyl becomes an increasingly popular drug for the control of pain. Recently, there have been reported cases of fentanyl abuse in which the drug was obtained from fentanyl drug patches. Marquardt reported a case of fentanyl poisoning in which the drug was scraped from the patch, heated and then inhaled (11). Intravenous abuse of fentanyl following aspiration of the drug from a patch was reported by DeSio (12). Another method of abuse is the application of several of the drug patches simultaneously.

We report a case of fatal fentanyl poisoning in which the decedent apparently obtained the drug from a fentanyl patch that had been left on a deceased patient. Prior to the discovery that he had had access to this decedent, investigators and relatives of the decedent were puzzled as to where he would have obtained this drug. The family vehemently denied that he would ever voluntarily administer intravenous drugs because he was "scared of needles." Transdermal fentanyl systems provide an alternative route of administration of this narcotic, possibly potentiating its abuse.

Fentanyl is not detected in most routine screening procedures for organic bases because it is present in very low concentrations. The limit of detection for most screening procedures for organic bases is 50–100 ng/mL or higher; the concentration of fentanyl in fatal drug related cases is usually lower than this amount. However, the drug is easily detected by commercially available radioimmunoassay kits. In this case, the laboratory detected the drug after a routine n-butyl chloride extraction procedure and screening by gas

chromatography. The drug was not detected in the initial screen by gas chromatography. However, during the GC/MS confirmation of other drugs present in the case (lidocaine, propoxyphene, and norpropoxyphene), a small peak in the area of fentanyl was examined by the GC/MS operator who noticed that the spectrum had similarities with fentanyl. Subsequent comparisons with library spectra confirmed the initial suspicion. An analysis by radioimmunoassay also indicated the presence of fentanyl. The drug was then quantified by GC/MS in the selected ion monitoring mode.

Summary

This case raises several important issues concerning transdermal fentanyl. There can be significant amounts of drug remaining in used transdermal drug patches, so the proper disposal of used patches should be a matter of policy and law. This avenue for access to fentanyl must be recognized in order to prevent similar deaths from occurring in this manner. Fentanyl derivatives are usually present at blood levels significantly lower than those for other drugs that are tested for on routine toxicologic drug screens (10,13). Therefore, they should be specifically tested for in cases of suspected drug overdose, particularly when lethal levels of other drugs are not present. As shown in this case, this holds true even with cases where the presence of fentanyl is not indicated by the history.

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