

CASE REPORT

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Persistence of Morphine in Blood in Association with Hepatic Necrosis and Renal Tubular Necrosis

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ABSTRACT: A case is reported in which a 26-year-old male survived in a hospital for 38 h after an intravenous heroin injection. Postmortem analysis showed 0.2 mg/100 ml morphine in the blood and 0.05 mg/100 g morphine in the liver. The persistence of morphine in the blood was attributed to the inability of damaged liver cells to take up the morphine and of the hypoxic kidney to excrete the compound.

KEY WORDS: toxicology, morphine, blood

Morphine is known to have a short half-life in blood after intravenous heroin injection. In-vitro and animal studies have indicated that heroin is rapidly deacetylated to 6-monoacetylmorphine with a half-life of approximately 9 min and that 6-monoacetylmorphine is then hydrolyzed to morphine at a slower rate, with a half-life of 38 min [1]. In approximately 30% of the acute heroin fatalities investigated by this office, morphine is not detected in the blood of decedents who have survived more than 1 h [2]. We report a case in which blood morphine was determined in an addict who survived 38 h after hospitalization.

Case History

A 26-year-old white male heroin user went to sleep in the afternoon. Several hours later, he could not be aroused, and the responding paramedics found him to be in asystole without spontaneous respirations. He was resuscitated but arrived at the hospital comatose, without spontaneous respirations, and hypotensive. He remained in this condition in spite of therapy and had very little urine output. Death occurred 38 h after admission to the hospital. Hospital reports indicated that no narcotics were administered in the hospital.

Pathology

At autopsy extensive hemorrhagic bronchopneumonia was found; there was no pre-existing medical disease. Microscopically, there was centrolobular hepatic necrosis and renal tubular necrosis, which were attributed to prolonged hypotension.

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Toxicology

Blood obtained at autopsy contained 0.02 mg/100 ml morphine and 0.01% ethanol. Morphine was not detected in bile but was present at a level of 0.05 mg/100 g in liver. Urine contained traces of morphine. Radioimmunoassay (RIA) procedures [3] were used for screening and gas chromatography analyses [4] for the determination of morphine in postmortem specimens. Urine, bile, and liver were hydrolyzed prior to extraction; blood was not hydrolyzed. The lowest limit of detectability of the gas chromatographic method for morphine was 0.005 mg/100 ml for blood and 0.01 mg/100 g for liver. No other drug was found in these specimens, nor was any hospital laboratory report available to indicate drug testing.

Discussion

Morphine is rapidly eliminated into the bile by the liver and into the urine by the kidney. Yeh et al [5] found that 84% of the morphine administered to ten subjects, in single doses of 10 mg/70 kg body weight, were eliminated into the urine within 8 h. Spector and Vesell [6] detected by RIA a low concentration of morphine in serum (about 0.3 μ g/100 ml) after 48 h in four of five subjects administered an intravenous dose of 10 mg/70 kg body weight. This prolonged presence of morphine was attributed to continued metabolism, tissue release, enterohepatic recirculation of morphine and its metabolites, or some combination of these factors. Laitinen et al [7] injected morphine intramuscularly in a dose of 0.2 mg/kg body weight in five subjects; they were unable, using RIA, to find measurable amounts of morphine in the serum after 24 h. Cravey and Reed [8] found 0.067 mg/100 ml morphine in the blood of a decedent who had died in a hospital from multiple gunshot wounds to the abdomen. Thirty-seven milligrams of morphine was administered to the patient over a 17 $\frac{1}{2}$ -h period; the final morphine injection was given 18 h before death. In this and other studies cited above which used RIA techniques, both morphine glucuronide and free morphine, if present, were measured after the administration of morphine. Our procedure specifically determined free morphine that had persisted in the blood in a heroin fatality.

Garriott and Sturner [9] assessed a suicidal, intravenous morphine injection and noted that the blood concentration of morphine in this case was 2.65 times as high as the highest blood morphine value they had observed in any other acute heroin overdose. These investigators stated that the difference was most likely due to the more rapid passage of heroin and monoacetylmorphine than of morphine itself from the blood to the organs.

In our case study, morphine from a heroin injection persisted in the blood for as long as 38 h. This persistence is attributed to the inability of damaged liver cells to take up morphine and of the hypoxic kidney to excrete the compound.

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