Intravenous Self-Administration of Metallic Mercury in Attempted Suicide*

Report of a Case with Serial Roentgenographic and Physiologic Studies over an 18-Month Period

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This report describes a 23-year-old white man who injected metallic mercury from a thermometer into his antecubital vein in an attempt at suicide. Despite the persistence of mercury throughout both pulmonary fields on chest x-ray films over an 18-month period of observation, no clinical or physiologic derangement of pulmonary function has developed. In addition, no clinical or biochemical evidence of acute or chronic mercury poisoning in any other organ has appeared during these 18 months, even though metallic mercury is seen in the abdominal visera on roentgenographic examination. The literature on suicidal and accidental poisoning with metallic mercury is reviewed.

Poisoning with metallic mercury, acquired both accidentally and following attempted suicide, is extremely rare. Since the beginning of this century, about 28 cases (with four deaths) have been reported. Attempts at suicide with metallic mercury have been reported in three such cases. Only one had a fatal outcome. A recent case report has described the intentional intravenous injection of metallic mercury in a boxer from Latin America, where such a practice is occasionally employed in the hope of enhancing athletic prowess. Accidental poisoning with mercury has occurred in many different ways, including rubbing mercury and mercurial ointments into wounds, tattooing, rupture of the mercury-filled bag of an indwelling intestinal tube, injury from a broken thermometer, and working with this element in industry. However, of particular importance is the observation that over the past 30 years, since metallic mercury replaced mineral oil as the anaerobic seal and mixing agent in syringes, most of the cases of accidental embolization of and poisoning with metallic mercury have occurred during the sampling of blood for analysis of blood gas levels.

In contrast to poisoning with liquid metallic mercury, the toxicity of metallic mercury vapors and salts has long been recognized in a variety of occupations. Long-term intoxication has been noted in hatters and furriers, resulting in a severe chronic brain syndrome, the "mad hatters." Short-term inhalation of mercury is rare and has been reported in patients involved in industrial accidents resulting in either sudden exposure to high concentrations of mercury vapor or to small amounts of mercury vapor in closed spaces. Clinically, these patients have been reported to experience cough and pharyngeal ulcerations as the most frequent manifestations. Less commonly, fever, pain in the chest and abdomen, dyspnea, vomiting of material with a metallic taste, and central nervous system symptoms, especially headache, have been noted.

The case we are reporting is of interest in that over an 18-month period of observation and study, no symptoms, signs, or discernable biochemical or physiologic abnormalities could be demonstrated either in the lungs, liver, gastrointestinal tract, or kidneys. No comparable observations have been reported.

Case Report

The patient is a 23-year-old white man who was receiving psychiatric care for depression and was first seen a few hours after an attempt at suicide during which he broke the tip of a mercury thermometer, punctured the antecubital vein of his left arm, and injected the mercury intravenously. The patient appeared to be in no acute distress. The findings from physical examination were unremarkable, as were also his complete blood cell count, the results of urinalysis, the levels of blood urea nitrogen and creatinine, the serum levels of electrolytes, the serum levels of calcium and phosphorus, and the results of studies of hepatic chemistry. An x-ray film of the chest (Fig 1 and 2) revealed the presence of metallic mercury in both pulmonary fields, more marked at the bases. No abdominal plain x-ray film was obtained when the patient was first seen.

Tests of pulmonary function were performed a week later, including a 14-minute graded treadmill exercise tolerance test, determination of pulmonary volumes, spirometric testing, studies of intrapulmonary gas distribution, analysis of the carbon monoxide diffusing capacity employing the single-breath method and of the mechanics of ventilation (consisting of pulmonary compliance and plethysmographic airway resistance), and analysis of arterial blood gas levels measured both at rest and following exercise. All results were within
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normal limits.

Over an 18-month period of follow-up, the patient has shown no clinical or biochemical evidence of damage to any organ. The chest x-ray film is unchanged and identical to Figure 1. All of the previously mentioned studies of pulmonary function were again performed 12 months following the incident, and the tests still revealed no abnormalities.

Of interest has been the observation of metallic mercury in the abdominal vascular bed in the only abdominal x-ray film available, one taken 15 months after the injection (Fig 3). This revealed mercury deposited probably diffusely in the viscera; however, no biochemical abnormalities in hepatic or renal function have been noted in so far as the results of studies of hepatic chemistry, urinalysis, and levels of blood urea nitrogen and serum creatinine are concerned. Attempts to chemically measure the presence and amount of mercury or its salts in saliva, urine, and feces of the patient were not possible, as his continuing severe psychiatric illness contraindicated his return for testing at this time.

DISCUSSION

Metallic mercury is a metal that has been known and used by man for many centuries. It has been widely used by physicians in the treatment of syphilis and tuberculosis. The ill effects produced as a result of self administration of the metallic form of mercury have appeared in scattered case reports. Umber1 reported the case of a physician's daughter who injected 2 ml of metallic mercury in an attempt at suicide and developed an acutely painful abdomen, stomatitis, proteinuria, and mercurial.
embolization into the pulmonary circulation, as seen on radiologic examination of the chest. She recovered and survived for ten years, dying later of an intercurrent and unrelated infection.1 Conrad et al2 also reported a similar case, with recovery after a week of acute illness. Studies by Schultz and Beskind3 and by Buxton et al4 have also described cases of embolization of mercury when the metal was used as an anaerobic seal and mixing agent in syringes used in collection of blood for measurement of levels of oxygen and carbon dioxide. In the series of Buxton et al,4 of a total of 1,063 cardiac catheterizations and blood gas analyses, nine cases of accidental embolization occurred.

The clinical syndrome of embolization of metallic mercury varies, depending presumably upon the quantity of mercury injected and the number of vessels occluded in the various involved organs. Embolization to the lungs is seen roentgenographically in most cases; and in some, including our patient, metallic mercury passes through the pulmonary vascular bed into the systemic circulation. Conrad et al2 and Buxton et al4 believe that the passage of metallic mercury from the right to the left side of heart occurs in the lungs through precapillary shunts or directly through the pulmonary capillaries. The magnitude of the symptoms vary from none, as in our case, to fatal involvement of multiple organs. The acute manifestations reported in the literature are nausea, vomiting, anorexia, bloody diarrhea, tremors, muscular weakness, and apprehension. Signs include stomatitis, tender and swollen gums, peripheral neuritis, and psychologic disturbances.

Few cases of pulmonary embolization of metallic mercury have been reported in which pulmonary function has been studied. The patient of Conrad et al3 was dyspneic and showed a decreased vital capacity (VC) and maximum breathing capacity on the fifth day of hospitalization. These values improved in studies performed six weeks later, although the mercury could still be seen on the x-ray film. In the report by Celli and Khan,4 their patient who received mercury intravenously to increase his athletic prowess was also dyspneic and demonstrated mild hypoxemia on admission; when first studied two weeks after admission, their patient showed a decrease in VC and diffusing capacity but no obstruction of the airways. By 20 weeks, both of these measurements had improved but were still abnormal. Our patient was not dyspneic and revealed no abnormalities in any of the multiple measurements performed one week following the injection and none 12 months later. Thus, it appears that in the dyspneic patient, a reversible restrictive pattern is present, and in the non-dyspneic patient, no physiologic disturbances are present.

The fate of injected metallic mercury has only been speculative. Follow-up of many of these cases has shown the gradual disappearance of metallic mercury from the tissues on radiographic observations. Buxton et al4 believe that slow ionization of metallic mercury occurs through biologic oxidation, forming mercuric salts which are largely excreted via the colon, kidneys, and salivary glands. This is believed to account for the symptoms of metallic mercurialism;4 however, actual chemical analysis of mercury and its salts in urine, feces, and saliva of the reported cases has not been performed. Although we attempted to perform such measurements on our patient, it was unfortunately impossible, due to his continuing severe psychiatric problems.

We suggest that the lack of symptoms and physiologic abnormalities in our patient over an 18-month follow-up period may reflect the fact that either (1) the total amount of mercury injected was small or (2) ionization, formation of salts, and excretion of the metal are not taking place or are occurring at sufficiently slow rates so as not to produce tissue levels of the mercury salts that are toxic and lead to symptoms or measurable biochemical abnormalities.

References


Successful Management of Massive Pulmonary Embolism Occurring during Cardiopulmonary Bypass for Mitral Valve Replacement*

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Massive pulmonary embolism occurred during cardiopulmonary bypass in a patient requiring mitral valve replacement. Successful management of this unusual problem is described.

Systemic venous thromboembolism occurring during cardiopulmonary bypass is a rarely encountered clinical entity. Previous reports have not been published in the thoracic surgical literature. Since the problem is

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