REPEATED SUICIDE ATTEMPTS
BY THE INTRAVENOUS INJECTION
OF ELEMENTAL MERCURY*

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ABSTRACT

The case of a patient who repeatedly injected himself intravenously with elementary mercury in suicide attempts is presented and the toxicological effects of this chemical form and route of exposure of mercury are examined. A review of the literature reveals that elemental mercury, when injected as opposed to inhaled, causes few of the effects typical of mercurialism; pleuritic chest pain was frequently reported, whereas renal and central nervous system involvement were less common. Evidence of premorbid psychiatric disturbances was found in ten of fourteen non-cardiac catheterization exposures to intravenous elemental mercury. Findings in our patient were consistent with these observations. One additional and noteworthy finding in

* NIH grants ES-01247 and ES-01248 provided funds for the mercury analyses. At the time of this case, Dr. Giombetti was a senior medical student on the Psychiatric Consultation-Liaison Service (PC-LS), Dr. Rosen was Associate Professor of Medicine and Psychiatry and Director of PC-LS, Dr. Kuczmierczyk was Senior Instructor in Psychiatry, and Dr. Marsh was Professor of Neurology all at the University of Rochester Medical Center, Rochester, New York.

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our case was that documented deposits of elemental mercury in the right parietal lobe of the brain did not correlate with any specific deficits on neuropsychological testing. Consultation-liaison psychiatry plays an important role in the treatment and care of these complex patients.

Unusual, bizarre suicide attempts occasionally come to our attention during clinical work and there is much to learn from such extreme cases [1]. We present a patient who had intravenously injected himself with elemental mercury in two separate suicide attempts. A biopsychosocial approach was utilized to afford a thorough understanding of this complicated case. Case reports describing the systemic effects of injected elemental mercury and psychiatric data from existing case reports were reviewed [2-14] (see Table 1). The purpose of this article is to investigate and discuss this unusual method of attempting suicide, to highlight the multidimensional nature of the assessment and treatment of such a complex patient, and to underscore the necessity of a collaborative approach between psychiatry and other medical specialties.

REVIEW OF A CASE

The patient, a married, unemployed, twenty-year-old male, had been electively admitted to the neurology service in March 1985 for workup of persistent complaints believed secondary to mercury intoxication. Symptoms upon admission were right-sided pleuritic chest pain, dyspnea on exertion, and anorexia with a 14 pound weight loss. The patient also complained of incoordination (difficulty holding objects and controlling movements), “memory” problems (frequently misplacing objects, losing his “train of thought”), and learning difficulties. This hospitalization was the sixth in little over a year, following rapidly one upon another after his first suicide attempt.

The patient had grown up on a farm, was the oldest of five children, and began to be physically abused by his father at age twelve. At age fifteen, the patient began dating. His father made sexual advances to the patient’s first girlfriend, had sexual intercourse with her, and boasted of this to his son and wife. Shortly after the patient began to experience auditory hallucinations. Voices, described as “whispers” repeated the phrase, “Death is with you.” The voices were not constant but worsened at times of stress. Paranoid ideation toward his father and females in general commenced. At age sixteen, the patient dropped out of the tenth grade, held down a job as a laborer, and privately “endured” for the next three years.

By age nineteen, the auditory hallucinations became constant and terrifying. Unable to cope with them at that time, the patient recalled the first conscious desire to kill himself to end his agony. Since age five he had been fascinated by elemental mercury and had collected it from thermometers throughout the years. In January, 1984, believing an injection of it would be lethal, he read
Table 1. Summary of Case Reports of Intravenous Injection of Elemental Mercury

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age</th>
<th>Sex</th>
<th>Pulmonary</th>
<th>Renal</th>
<th>CNS</th>
<th>Other</th>
<th>Psychiatric</th>
<th>Reason</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umber [2] (1923)</td>
<td>35</td>
<td>F</td>
<td>Pleuritic chest pain</td>
<td>None</td>
<td>? Vasomotor arousal</td>
<td>Abdominal pain, diarrhea, stomatitis, gingivitis</td>
<td>None reported</td>
<td>Suicide attempt</td>
<td>Asymptomatic at 2-month followup</td>
</tr>
<tr>
<td>Haubrich et al. [3] (1949)</td>
<td>25</td>
<td>F</td>
<td>Pleuritic chest pain</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Psychopathic personality</td>
<td>? Accident</td>
<td>Asymptomatic at discharge</td>
</tr>
<tr>
<td>Conrad et al. [4] (1957)</td>
<td>26</td>
<td>M</td>
<td>Dyspnea, pleuritic chest pain, abnormal pulmonary function tests</td>
<td>Proteinuria, hyaline casts</td>
<td>None</td>
<td>None</td>
<td>Schizoid personality</td>
<td>? Suicide attempt</td>
<td>Asymptomatic at 2-month followup</td>
</tr>
<tr>
<td>Schulz et al. [5] (1960)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not applicable</td>
<td>Unknown</td>
<td>No followup reported</td>
</tr>
<tr>
<td>Case 1</td>
<td>4</td>
<td>M</td>
<td>None</td>
<td>None</td>
<td>Falling, unconsciousness, jerking extremities</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Asymptomatic throughout</td>
</tr>
<tr>
<td>Case 2</td>
<td>11</td>
<td>F</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Death</td>
</tr>
<tr>
<td>Buxton et al. [6] (1965)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Occasional leg pain on followup</td>
</tr>
<tr>
<td>Author (Year)</td>
<td>Age</td>
<td>Sex</td>
<td>Pulmonary</td>
<td>Renal</td>
<td>CNS</td>
<td>Other</td>
<td>Psychiatric</td>
<td>Reason</td>
<td>Reason</td>
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<tr>
<td>Case 3</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Death secondary to rectal hemorrhage</td>
</tr>
<tr>
<td>Buxton et al.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 4</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>No followup</td>
</tr>
<tr>
<td>Case 5</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Left cerebral abscess</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Alive and well with residual right-sided weakness</td>
</tr>
<tr>
<td>Case 6</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Leg weakness</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Symptoms persisted on several followup visits—no later reports</td>
</tr>
<tr>
<td>Case 7</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Asymptomatic through</td>
</tr>
<tr>
<td>Case 8</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Asymptomatic through</td>
</tr>
<tr>
<td>Case 9</td>
<td>?</td>
<td>?</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not applicable</td>
<td>Cardiac catheterization accident</td>
<td>Death after cardiac surgery</td>
</tr>
<tr>
<td>Johnson et al.</td>
<td>23</td>
<td>F</td>
<td>None</td>
<td>Increased blood urea</td>
<td>Muscle spasms, rigidity, coma</td>
<td>None</td>
<td>Not reported</td>
<td>?Suicide attempt</td>
<td>Death secondary to sepsis</td>
</tr>
<tr>
<td>Nardich et al.</td>
<td>25</td>
<td>M</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>IV Heroin user “Kicks”</td>
<td>Not reported</td>
</tr>
<tr>
<td>Case 1</td>
<td>24</td>
<td>F</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>IV Heroin user “Kicks”</td>
<td>Not reported</td>
</tr>
<tr>
<td>Case 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Age</td>
<td>Sex</td>
<td>Symptoms</td>
<td>Laboratory Findings</td>
<td>Diagnosis</td>
<td>Complications</td>
<td>Outcome</td>
<td></td>
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<td></td>
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<tr>
<td>Ochs et al. [9] (1975)</td>
<td></td>
<td></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None reported depression, suicide attempt</td>
<td>Asymptomatic throughout</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Case 1</strong></td>
<td>30</td>
<td>F</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Suicide attempt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Case 2</strong></td>
<td>19</td>
<td>F</td>
<td>Dyspnea, pleuritic chest pain</td>
<td>None</td>
<td>Lack of concentration</td>
<td>None</td>
<td>Asymptomatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celli et al. [10] (1976)</td>
<td>14</td>
<td>M</td>
<td>Dyspnea, pleuritic chest pain, abnormal arterial blood gases and abnormal pulmonary function tests</td>
<td>None</td>
<td>None</td>
<td>Not reported &quot;Strengthen punches&quot;</td>
<td>Gradual improvement to asymptomatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambre et al. [11] (1977)</strong></td>
<td>31</td>
<td>M</td>
<td>Abnormal arterial blood gases</td>
<td>None</td>
<td>Headache</td>
<td>Metallic taste, IV drug user</td>
<td>Asymptomatic at 1-year followup</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zosin et al. [12] (1977)</strong></td>
<td>28</td>
<td>F</td>
<td>Dyspnea, pleuritic chest pain</td>
<td>Oliguria, proteinuria, increased serum creatinine</td>
<td>Lethargy, paresthesia</td>
<td>Not reported</td>
<td>Suicide attempt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chitkara et al. [13] (1978)</strong></td>
<td>23</td>
<td>M</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Severe depression throughout</td>
<td>Suicide attempt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hannigan [14] (1978)</td>
<td>34</td>
<td>M</td>
<td>Abnormal pulmonary function tests</td>
<td>? Decreased creatinine clearance</td>
<td>None</td>
<td>Unspecified psychiatric illness</td>
<td>Asymptomatic throughout</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
from the Book of Genesis, then injected about one millimeter of mercury into an antecubital vein. When nothing immediately happened, he drank an unspecified quantity of methanol. The onset of nausea and blurred vision brought him into a community hospital, where he was comatose for three days. He awoke ataxic and completely blind, but returned to "normal" in a few days. The diagnosis of suicide attempt by elemental mercury injection was made and he was treated with penicillamine to chelate the mercury. (Interestingly, during this first hospitalization the patient acquired more mercury from a blood pressure gauge, but did not attempt suicide again at that time.) When transferred to the psychiatric unit, he denied auditory hallucinations. He was diagnosed as having a psychotic depression and treated with trazodone 250 mgm po qhs, the patient was discharged to a halfway house in early March 1984. Here he admitted to auditory hallucinations, was diagnosed as schizophrenic, and treated as an outpatient with thiothixene 40 mgm po qd and benztpine mesylate 6 mgm po qd. The patient also continued to take penicillamine 250 mg po bid.

In late March 1984, the patient again considered suicide, but he did not make another attempt by injecting himself with mercury at that time. He was admitted to a private psychiatric hospital, stabilized rapidly, and was discharged to his family in ten days. Discharge medications were imipramine 250 mg po bid, thiothixene 5 mg po qhs, and penicillamine 250 mg po bid.

On June 5, 1984 following a violent disagreement with his father, the patient was again admitted to his local community hospital after he injected 3 ml of elemental mercury into his left antecubital vein and left ankle in response to command hallucinations. He presented with pleuritic chest pain and "involuntary" shaking, was in no distress, had a respiratory rate of 20 and slightly shallow breathing, and an otherwise entirely unremarkable physical exam. Chest X-ray revealed an increase in metallic densities in both lung fields over previous admission. Arterial blood gases were pH 7.43, PO₂ 82, PCO₂ 41. The patient was medically cleared, transferred to the psychiatry unit, found not to be acutely psychotic, and discharged on June 20, 1984 on only benztpine mesylate 10 mg po qhs and penicillamine 250 mg po bid.

Two days later, after witnessing a disagreement between his parents, the patient became severely depressed, fearful, anxious, preoccupied, with morbid thoughts, and was readmitted to the same psychiatric unit. His physical exam was only significant for a left ankle abscess. A skull X-ray series revealed three small metallic densities in the right parietal region. He improved significantly in the psychiatric inpatient setting but when he began to decompensate nearing discharge, he was voluntarily transferred to a state hospital on July 17, 1984. (Medications at that time were chlorpromazine 500 mg po qd, imipramine 200 mg po qhs, diphenhydramine hydrochloride 50 mg po bid, and penicillamine 250 mg po bid.) The patient intensely disliked the state hospital, again falsely denied auditory hallucinations, and was discharged to his home on August 10, 1984 on the same medication regimen.
About a month later, while living at home, the patient was involuntarily readmitted to the state hospital having taken a large, unspecified amount of chlorpromazine supposedly to treat worsening auditory hallucinations. He again stabilized in the inpatient setting and was discharged in October. (Medications were imipramine 100 mg po bid, thioridazine 100 mg po tid, and penicillamine 250 mg po bid.) The patient again falsely denied auditory hallucinations during that admission but was not suicidal at any time. His auditory hallucinations stopped shortly after discharge. He then discontinued his medications and was lost to follow-up for five months.

The patient met his wife during his first psychiatric admission and began dating her soon after his discharge in October 1984. She was a thirty-four-year-old former nurse's aide who had been married five previous times. Two of her former husbands were alcoholics, one was schizophrenic, and all had been physically abusive. She had been hospitalized twice for major depression. The couple married in January 1985 and since that time both partners have been unemployed on public assistance.

On admission in March 1985, the patient appeared younger than his age and was lying comfortably in bed, unkempt, with straggly brown hair. On physical exam, mild right chest wall tenderness to compression was noted with normal heart, lung, abdominal, and genitourinary exams. On neurological exam, bilateral lateral gaze nystagmus was noted, along with a slight postural and hand tremor that became evident with anxiety. Finger-to-nose and heel-to-shin testing were slow but intact. On Romberg testing, the patient swayed but caught himself before falling. Tandem walk was mildly impaired.

Admission laboratory data were remarkable for a chest X-ray which revealed multiple small, metallic densities. Left ankle and arm X-rays revealed similar densities. Blood mercury level was 473 ng/ml (normal = 30 ng/ml) [15]. SMA6, SMA12, CBC, and EKG were all within normal limits. Urinalysis revealed + proteinuria. Arterial blood gases on room air were normal. An extensive workup was undertaken with consultants from pulmonary medicine, nephrology, surgery, consultation/liaison psychiatry and neuropsychology.

Pulmonary function testing was most consistent with mild restrictive disease and thought primarily due to poor effort. Visual field testing was normal. A head CT scan revealed two small, metallic densities in the right parietal lobe (Figure 1) but, unexpectedly, Magnetic Resonance Imaging of the brain was normal. An electroencephalogram was normal. Neuropsychological testing did not reveal any specific right hemisphere deficits. There were negligible deficits in visuomotor, visuoperceptual, and constructional abilities. However, the cognitive deficits noted were largely verbal in nature appearing generally consistent with life-long deficits in attention/concentration and in learning. A trial of penicillamine, 250 mg qid, was begun.

Consultation/liaison psychiatry was asked to see this patient to assess suicidality and assist in management. On mental status examination, the patient
was alert and oriented to time, place, and person. His mood was euthymic, and affect ranged appropriately from cheerful to slightly sad. Initially, suicidal ideation was not present, thought content and processes were not abnormal, and the patient denied auditory or other hallucinations. The patient repeated seven digits forward and three digits backwards, but was unable to perform serial seven's. He did perform serial three's from twenty to completion. The patient could recall two of three objects at five minutes. Remote memory was intact. Information, vocabulary, and similarity testing were all consistent with the patient's level of education. The patient interpreted proverbs correctly and had appropriate judgment and comprehension. His insight was fair. The diagnostic impression was schizoaffective disorder, in remission; our initial recommendation was that suicide precautions were unnecessary but that the patient should be kept away from sources of mercury and followed closely for any change in suicidality.

Psychological tests were recommended and carried out by the liaison psychologist (A.R.K., one of the co-authors). The patient's MMPI profile was representative of an individual who tends to manifest chronic worrying, fears and anxieties, self-preoccupation, figures of inferiority and inadequacy, and
difficulties in sustaining positive interpersonal relationships. At times of stress, he may tend to show signs of schizoid regression. A preoccupation with multiple, vague somatic complaints was noticed but suicide was not an apparent risk. The Beck Depression Inventory scale fell within the category of “moderately depressed” individuals. His Rosenbaum Self-Control Scale suggested that he had little tolerance of problems encountered in daily living.

Historically, this patient had a tendency not to report the presence of auditory hallucinations. This was of concern to us, and during the course of this hospitalization, the patient did so report. Suicide precautions were taken (one-to-one nursing) then felt unnecessary and discontinued. Chlorpromazine 400 mg po qd was begun, but decreased to 200 mg po qd after two days when the patient complained of drowsiness. Auditory hallucinations reportedly disappeared two days after their onset and did not recur. The patient was not overtly suicidal at any time during his hospitalization and was discharged after three weeks. Subjective reporting of pleuritic chest pain, incoordination, and memory loss persisted throughout his hospitalization. Discharge medications were penicillamine 250 mg po qd and chlorpromazine 200 mg po qd. Follow up care was arranged.

TOXICOLOGICAL FACTORS

Factors involved in determining clinical symptomatology in mercury poisoning are primarily chemical. The route of exposure is usually by inhalation or ingestion. Elemental mercury vapor crosses the blood-brain barrier and causes central nervous system symptoms including tremor, ataxia, and erethism.\(^1\) Acute inhalation of elemental mercury vapor often results in transient respiratory distress with dyspnea and chest pain and can rarely result in a diffuse interstitial pneumonitis [15]. Organic mercury toxicity, so called “Minamata disease,” is a substantial health hazard characterized by central nervous system degeneration with progressive symptoms of paresthesias, ataxia, visual field defects, dysarthria, hearing defects, and death [15].

Inorganic mercury does not readily cross the blood-brain barrier [16] and central nervous system effects are much less common [15]. However, mercury salts are corrosives and can cause severe gastrointestinal injury. The other major problem with ingestion of inorganic mercury is renal toxicity that can result in acute tubular necrosis [15]. The amount and time course of exposure are important considerations and syndromes of acute and chronic mercurialism are described [17].

The toxicological effects of mercury are thought to be due to a disruption of biochemical processes by the complexing of mercuric cations to protein

\(^1\) Erethism is a neuropsychiatric state characterized by anxiety, easy irritability, affective lability, depression, insomnia, and vasomotor hyperactivity with increased sweating and blushing [15].
sulfhydryl groups [15]. The extent of metabolic disturbance in particular areas is related to tissue distribution. A bolus of intravenously injected elemental mercury does not distribute widely as does inhaled atomic mercury vapor, appears to be relatively insoluble in blood, remains in droplets and dissolves slowly over a long period of time [18]. The small amount of mercury that does dissolve is rapidly oxidized to mercuric cations [19] and therefore is less likely to enter the central nervous system. Excretion of mercuric cations takes place primarily in the kidneys and across the gastrointestinal mucosa [16]. The importance of these considerations relates to the differential effects of various chemical forms of mercury on different target organs. Certainly, some symptoms can be caused by the physical, mechanical and inflammatory effects of the deposition of a heavy metal in human tissue and its subsequent embolization. However, from a toxicological standpoint, intravenously administered elemental mercury appears to be relatively stable, metabolized slowly to low levels of toxic forms which are excreted and somewhat restricted from entering the central nervous system. With such a profile, significant clinical manifestations are less likely to be a direct result of toxicological effects of mercury.

REEXAMINATION OF OTHER REPORTED CASES

We found twenty-four cases of intravenous administration of elemental mercury in the literature. Ten cases were accidents secondary to cardiac catheterization [5, 6]. Five were known suicide attempts [2, 9, 12, 13]. Three were possible suicide attempts [4, 7, 14]. Four cases appeared to be covertly self-destructive [3, 8, 11]. One case was to "strengthen punches" [10] and one case of a four-year-old boy was unknown [5]. All of these reports are summarized in Table 1.

In virtually all cases, the chest X-rays were remarkable for metallic densities, but this finding in itself was not taken as evidence of pulmonary impairment as the majority of these patients were entirely asymptomatic. Celli reported acute respiratory distress, abnormal arterial blood gases (ph 7.48, PO₂ 60, PCO₂ 35), and a marked decrease in diffusing capacity and total lung capacity after a 20 ml injection of elemental mercury [10]. This patient improved clinically over two weeks and pulmonary function tests reverted to near normal values at twenty weeks. Ambre found abnormal arterial blood gases (ph 7.46, PO₂ 77, PCO₂ 33) [11] while Hannigan discovered a decreased diffusing capacity, both in asymptomatic patients [14].

Renal involvement, described as a "steady rising blood urea," in the patient of Johnson [7] was probably a manifestation of septic shock. Zosin noted oliguria, proteinuria, and an increased creatinine, all of which resolved before discharge [12].
Central nervous system involvement was described by Schulz [5] and this was attributed to mercury when scattered intracranial metallic densities were found. Buxton described four cases of central nervous system involvement in his series of nine patients with mercury emboli following cardiac catheterization procedures [6]. In case one the patient initially presented with paresthesias and tenderness in both legs two days after cardiac catheterization. At one month, headache, anorexia, bloody diarrhea, and a wandering pacemaker were noted. Signs and symptoms gradually progressed to lethargy, seizures, blindness with fundoscopic evidence of central retinal artery occlusion by mercury globules, partial right hemiplegia, right facial paralysis, right-sided spasticity, bilateral Babinski signs, ankle clonus, coma, hyperpyrexia, and death five months post-cardiac catheterization. Skull X-rays revealed intracranial deposits of mercury which over time became larger and less diffuse. The outcome was probably secondary to cerebral mercury emboli causing massive areas of infarction and not mercury toxicity per se. In case 5, Buxton associated a cerebral abscess of unknown origin with evidence of mercury embolization to lungs discovered three years prior to abscess formation [6]. Buxton's two other cases of central nervous system involvement (cases 4, 6) were also associated with mercury toxicity. Johnson's reported sequelae of muscle spasms, rigidity, and coma were again probably manifestations of sepsis [7]. Ochs [9] and Ambre's [11] patients both had transient findings. Zosin noted paresthesias and lethargy in a patient also found to be alert and oriented in all three spheres, whose neurological course was later complicated by a tetanus crisis [12].

Other signs and symptoms of mercurialism were reported. Stomatitis and gingivitis were noted in two cases [2, 12] while gingival hypertrophy was found in one case [6]. Abdominal pain and/or diarrhea were found in four cases [2, 6, 12], only one of which had bloody diarrhea [6].

Premorbid psychiatric disturbances were common. Haubrich reported the case of a twenty-five-year-old female, "psychiatrically labile" factory worker with a diagnosis of psychopathic personality who "accidentally" intravenously administered elemental mercury when a thermometer broke [3]. The patient's sister was a nurse proficient at venipuncture and there was reason to believe that there were multiple injections by either the patient or her sister. Conrad's case dealt with a twenty-six-year-old radar mechanic with a diagnosis of schizoid personality disorder who denied mercury injection even during an amobarbital interview [4]. Ochs reported the case of a nineteen-year-old female with an extensive psychiatric history who injected mercury in a suicide attempt [9]. This patient was noted to have "poor developmental milestones secondary to a deprived environment" and was sexually abused by her stepfather until puberty. She had made several previous suicide attempts, including one other by injecting mercury, had multiple psychiatric hospitalizations, and was an alcoholic, barbiturate, and IV drug abuser. Chitkara reported a twenty-three-year-old white
male that attempted suicide while being treated for “severe” depression [13]. Ochs also reported a thirty-year-old female with multiple chronic medical problems who attempted suicide, probably in the midst of a depressive episode [9]. Hannigan reported a thirty-four-year-old male with an unspecified psychiatric illness who injected mercury without a reason given [14]. Nardich published chest X-ray findings of a twenty-five-year-old black male and his twenty-four-year-old black female girlfriend, both heroin addicts, who injected mercury for “kicks” [8]. Celli reported a fourteen-year-old male boxer from British Honduras who injected mercury to “strengthen his punches” [10]. The authors report intramuscular injection of metallic mercury to be a common practice in many Latin American countries in the hope of developing stronger muscles. Finally, Ambre reports a thirty-one-year-old radio and television repairman, IV drug user, who “mistakenly” injected mercury [11].

As for outcome after injection of mercury, four patients died after mercury embolization [6, 7] although not due to the direct toxicological effects of mercury. Buxton’s case 1 is summarized above [6]. Another death was a patient of Buxton’s (case 3) with chronic medical problems including alcohol abuse that died of a rectal hemorrhage after findings of chest and abdominal mercury were made by X-ray three years previously [6]. The other death among Buxton’s patients was a neonate (case 9) that died following cardiac surgery. Johnson described the case of a “twenty-three-year-old intelligent, healthy female lab technician” who injected 1–2 ml of mercury and presented three weeks later with a swollen, tender left forearm and median nerve involvement [7]. After surgical exploration this patient developed fever, tachycardia, muscle spasms, rigidity, and later coma requiring intubation, and a steadily rising blood urea. The patient died thirty-one days after injection. Of the remaining cases, eleven went on to full recovery [2-4, 6, 9-11, 13, 14], seven were entirely asymptomatic [5, 6, 9, 13, 14], one was alive with residual right-sided weakness [6], one had occasional leg pain [6], one had persistence of fatigue and leg weakness [6], one had diarrhea and stomatitis at one-year follow-up [12], and in four cases outcome was not reported [5, 6, 8].

DISCUSSION

Some inferences can be drawn from the review of the literature. Although evidence of central nervous system toxicity was present in ten cases, it was nonspecific. Concern should exist for the possibility of cerebral embolization of mercury and the resultant potential for infarction. No interstitial pneumonitis was reported—pulmonary involvement can be explained solely on the basis of pulmonary embolization. In the five cases of renal involvement, evidence was usually mild and nonspecific, and only one case progressed to oliguria and never to acute tubular necrosis. Gastrointestinal tract involvement was evidenced by the infrequent occurrence of nausea, diarrhea, stomatitis, and gingivitis, all of
which cleared. Renal and gastrointestinal symptoms may be explained as both organ systems are principal areas of mercury excretion. Lastly, death never occurred as a direct result of the toxicological effects of mercury.

The clinical profile of our patient was consistent with these conclusions. Pleuritic chest pain had been noted since his initial hospitalization for mercury injection and slightly abnormal arterial blood gases were noted following his second, larger injection. His pulmonary function testing was remarkable for its normality. The only evidence for renal involvement was mild proteinuria. Cerebral embolism of mercury to the right parietal lobe did occur but there was no evidence of significant corresponding cortical dysfunction. It is noteworthy that the metallic densities decreased from three to two over a nine-month period when comparing the earlier skull films to the head CT scan. This suggests that one of the droplets of mercury in the right parietal lobe oxidized to mercuric cations and was subsequently excreted.

Psychiatric considerations with our patient included careful assessment of suicidality and accurate diagnosis, especially since previous suicide attempts were in the context of acute psychosis manifested by command auditory hallucinations. Psychological testing supported the clinical impression of schizoaffective disorder, in remission.

This patient’s family and social milieu was a critical variable in his overall well-being. Past psychiatric problems and suicide attempts were directly related to family or social disturbances. The patient’s social and interpersonal situation has stabilized somewhat with his marriage, although betrothal to an emotionally disturbed woman who is close to his mother’s age may well present a problem. Since the patient now perceives himself as having a chronic physical illness, namely chronic mercurialism, he might now express intrapsychic conflicts in terms of somatic complaints as opposed to suicidal intent. His psychological profile supports this hypothesis.

Lastly, why inject mercury? A simple explanation could be that it is perceived to be lethal. Most patients were indeed suicidal. But some did it for “kicks” and one, curiously, to increase his physical strength. Thought disorder and hallucinations were sometimes present. Our patient had a life-long fascination with mercury, first injected elemental mercury after reading the Book of Genesis and was repeatedly taunted by auditory hallucinations commanding him to die by killing himself.

It may be of interest to speculate on the symbolic importance of mercury as it may relate to its association with the god Mercury. Conceptualization in terms of mythology may help to understand the seemingly bizarre occurrence of injection of elemental mercury. Mercury’s unique nature as a liquid metal with its fluid and dynamic qualities parallels Mercury’s special characteristics as a god and mythological figure. The god Mercury, with his winged hat and caduceus, was a messenger between the underworld, the earth, and heaven who guided lost souls to salvation. He represented in a symbolic sense the unlimited capacity for
transformation (as all liquids do, i.e., vaporization) of matter to spirit, of the inferior or evil to the superior or good, and of a transitory state to a stable one. As noted, Mercury carried the caduceus (symbol of healing and "death and rebirth"), perhaps our patient’s suicide attempts and the others’ self-destructive acts represented primitive and misguided efforts at self-healing in psychiatrically disturbed individuals.

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