

Death by self-inflicted asphyxia with helium – First case reports from Norway and review of the literature

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ABSTRACT

An increasing number of asphyxia suicides by inhalation of inert gases have been reported from different parts of the world over the last decade. So far this phenomenon has not been described in our country. This article presents the first two case reports from Norway of presumed suicide by asphyxiation due to helium inhalation from a closed plastic bag over the head. In both cases a forensic autopsy, which included comprehensive toxicological analysis, was requested and performed. In the two cases death was attributed to asphyxia due to helium inhalation, and suffocation due to a plastic bag over the head and aspiration of gastric contents, respectively. Toxicological analysis revealed no findings contributing to the deaths. The absence of toxicological and autopsy findings to determine the cause of death in such cases may represent challenges of clinical and forensic significance. In contrast to the promotion of this method by euthanasia interest groups for the terminally ill reported suicides by helium asphyxiation primarily involve relatively young individuals suffering from psychiatric and/or substance use disorders, and not from terminal illness.

Keywords:

Suicide, asphyxia, helium, gas, toxicology

INTRODUCTION

Over the last decade an increasing number of asphyxia suicides by inhalation of inert gases have been reported from different parts of the Western world. Case reports of suicides by this method have been published from the United States, Australia and Europe [1-5]. A few cases from Sweden and Denmark have been described, but not from the other Nordic countries, including Norway [1,2]. Interest groups advocating euthanasia, e.g. so-called "right-to-die"-organizations, have promoted this method on the internet and in books, magazines and films as a way of "self-deliverance" for the terminally ill. Arguably the most widespread source is *Final Exit: The Practicalities of Self-Deliverance and Assisted Suicide for the Dying*, a controversial book giving practical guidance and detailed instructions on how to plan and commit suicide, including the use of inert gases in a plastic bag over the head [6].

Inhalation of pure helium gas under atmospheric pressure may cause asphyxia through the displacement of O₂ and CO₂. Because of effective removal of CO₂ respiratory drive is inhibited. Continued inhalation of helium is reported to induce loss of consciousness within 5-10 s and hypoxic death within few minutes [7-9].

In this article the first two case reports from Norway of presumed suicide by asphyxiation due to helium inhalation from a closed plastic bag over the head are presented, and aspects of clinical and forensic relevance are discussed. The article provides a brief overview of the current literature on self-inflicted asphyxia with helium.

The deaths took place in Central Norway in the period 2009-2011.

Case reports

Case 1. A 43 year old male was found dead in his apartment with two gas cylinders labeled helium next to him. Two plastic tubes were connected to the gas cylinders and placed under a plastic bag over his head. The plastic bag was fastened with tape and a cord around the neck. No suicide note was found. The police were at the scene when the deceased was found. A forensic autopsy was requested and performed, which showed decompositional changes, but no injuries or diseases that could explain the death. Toxicological analysis showed ethanol and tetrahydrocannabinolic acid in urine, but no positive findings in blood. It was not excluded that the detected level of ethanol in urine was a result of post-mortem microbial formation. No certain cause of death could be established. Based on the external circumstances death was attributed to asphyxia due to helium inhalation and the presumed manner of death was suicide.

Case 2. A 31 year old male was found dead by his wife in their home with a plastic bag over his head and two helium cylinders next to him. The cylinders were connected to the plastic bag with tubes. The plastic bag had an integrated, adjustable cord in the opening. Paramedics, who were first at the scene, reportedly found the gas cylinder valves open. A suicide note was found on a table in the living room. The police was notified about the death and investigated the scene. A forensic autopsy was requested and performed, showing bilateral eyelid petechiae and large amounts of gastric content in the esophagus, pharynx and large and small airways. No injuries or diseases were found. Toxicological analysis showed non-toxic/therapeutic concentrations of lamotrigine (2.6 mg/L), citalopram (0.17 mg/L) and

diazepam (0.017 mg/L). The medical examiner's conclusion as to the cause of death was suffocation due to a plastic bag over the head and aspiration of gastric contents. Based on autopsy findings and outer circumstances the death was presumed to be a suicide.

DISCUSSION

The reported cases illustrate the absence of specific findings at autopsy and routine toxicological analysis in deaths assumed to be caused by asphyxiation with an inert gas. The detection of helium in specimens from the deceased in such cases may be of value to tentatively distinguish between helium exposure, exposure to a merely oxygen-deficient atmosphere and external obstruction as the mechanism of death, but there are, to the author's knowledge, no established procedures for quantitative measurement and interpretation of helium levels in body fluids or tissues. Several methods for helium detection in bronchopulmonary air samples have been published, using headspace gas chromatography-mass spectrometry with nitrogen or hydrogen as carrier gas [10-12]. These methods, however, require special techniques and equipment at autopsy and laboratory analyses, and have not been refined and validated for routine application. A recently published gas chromatography-thermal conductivity detection method for helium in post-mortem blood and lung, brain and liver tissue specimens provides a simpler sampling procedure, but the authors emphasize that the method is solely for screening purposes, and that it was not possible to establish an incontrovertible identification of helium [13]. Accordingly, the cause of death in such cases generally has to be assessed from investigations of the circumstances and scene of death. This raises the question whether this death method may be used to conceal murder, e.g. by removing necessary equipment after death or leave behind a scene seemingly implying suicide. As interest groups for euthanasia refer to this method for assisted suicide for the terminally ill, and even provide practical advice of how to cover such acts, concern has been raised about the event and possible neglect of concealed suicides as well, in which the deceased has been aided by one or more persons in the practical procedures and subsequent disposal of applied implements [5,14,15]. If death in such cases is attributed to the underlying disease, this may have practical implications with regard to insurance settlements, cause of death statistics etc., as well as a more socio-religious aspect by the possible omission of stigmata often associated with suicides.

In Switzerland assisted suicide is permitted by law, providing that it is performed "without selfish motives", and that the individual who wishes to die carries out the final act (e.g. drug administration, mask application, helium inhalation, etc.) independently [9]. Following these terms and conditions Swiss law allows anyone to assist in suicide. In practice, "right-to-die"-organizations have led this activity with routine reporting of these deaths to the authorities [9]. One of these organizations has evaluated helium asphyxiation as an alternative to drug-induced euthanasia (usually performed with barbiturates), seeking to establish a method for assisted suicide not requiring the presence and assistance of medical personnel. This has facilitated studies of the course of such deaths. An examination of video recordings of four assisted suicides by oxygen deprivation with helium and a face mask with reservoir bag has been published [9]. In this study the authors reported wide variation in both time to unconsciousness and time to death. Time to unconsciousness ranged from 36 to 55 seconds, whereas time to

death was 5-10 minutes in three of the cases and more than 40 minutes in one. These variations were attributed to differences in mask fit. No attempts to adjust the masks were made by the assistants once it had been positioned, since this would likely be in conflict with the law, which prohibited assistance in the final act. Seemingly uncoordinated movements were observed, but none of the dying individuals touched the mask or attempted self-rescue. In a different study two cases of self-asphyxiation with helium and a plastic bag over the head instead of a mask were observed and described [8]. In this study the reported time to unconsciousness was 10-12 seconds. In our case 2 autopsy revealed bilateral eyelid petechiae and large amounts of gastric content in the airways. These findings challenge the assumption that death by this method is painless and without air hunger, as asserted in *Final Exit*.

Our two cases were both relatively young, white men with no documented diseases. In particular, they did not fulfill any criteria for terminal illness. Toxicological analysis revealed psychoactive substances in blood in one case, and an inactive cannabis metabolite in urine in the second case; both common findings without any particular negative prognostic significance. This conflicts with the promotion of this method by euthanasia interest groups for terminally ill patients, and is in concordance with most previously published cases. In a systematic investigation of asphyxia suicides involving helium from North Carolina a majority of the decedents were not terminally ill, but suffered from psychiatric and/or substance use disorders [16]. The suicides involving helium in this material also tended to occur almost exclusively in relatively young white males [16].

The link between the description of this suicide method in *Final Exit* and the sudden increase in reported cases has also been investigated. In 2003 seven fatalities involving plastic bag suffocation in conjunction with helium use was reported from Arizona [4]. These fatalities coincided with the first account of the method in *Final Exit*. Such deaths had not been previously observed in this region, and although right-to-die literature was absent from all scenes the authors concluded that the deaths likely reflected exposure to this information. A retrospective review of helium-related suicides in Australia over a 25-year period from 1985 to 2009 and Swedish data obtained between 2001 and 2009 showed recent and striking increases of such cases in all investigated areas, with no identified cases before 2000 [1]. In light of the availability of helium and the promotion of this method of suicide, the authors stated that this might represent a newly emerging trend in suicide deaths. An earlier study from New York City found a substantial increase in the number of asphyxiations by plastic bag (without inert gas) in the year after the first publication of *Final Exit*, but insignificant changes in the number of suicides by other methods and the overall suicide rate [17]. *Final Exit* was found at the scene of 9 of the 33 suicides by asphyxiation in this material. Very few of those who had probably consulted the book had a history of terminal disease or evidence of this at autopsy, and at least one third of all suicide cases where *Final Exit* probably was consulted had a psychiatric history that included a previous suicide attempt, hospitalization or treatment. This further corroborates the apprehension that the promotion of this method by "right-to-die"-societies impinges deeply troubled or mentally ill persons, who may otherwise have benefited from therapy, rather than the terminally ill. Interestingly, an investigation of the prevalence and correlates of helium inhalation in adolescents under residential treatment for delinquent behavior in Missouri showed that helium users were significantly more likely to be Caucasian, live in rural/small town areas, and to have histories of mental illness, auditory hallucinations, and alcohol and

marijuana use than nonusers [18]. Helium users in this material also reported significantly more current psychiatric distress, suicidality, traumatic life experiences, and antisocial attitudes, traits and behaviors than nonusers. How this relates to suicidal asphyxiation with helium, however, is not known.

Herein, we have presented the first two case reports from Norway of presumed suicide by asphyxiation due to helium inhalation from a closed plastic bag over the head. These cases add to an increasing number of asphyxia suicides by inhalation of inert gases reported from different parts of the world over the last decade. Considering the striking rise in reported cases, recognition of this phenomenon and its potential pitfalls for clinical and forensic practice is of importance, particularly for medical

examiners, toxicologists and crime scene investigators. In contrast to the promotion of this method by euthanasia interest groups for the terminally ill reported suicides by helium asphyxiation primarily involve relatively young individuals suffering from psychiatric and/or substance use disorders, and not from terminal illness.

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