Original article

How common are suicides using nitrous oxide?

Medicine, Science and the Law
2019, Vol. 59(3) 160–163

DOI: 10.1177/0025802419852184
journals.sagepub.com/home/msl
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Abstract

Analysis of autopsy cases of suicide from Forensic Science South Australia files (2003–2017) where helium, nitrogen or nitrous oxide gas had been used revealed that only 2/58 (3.5%) cases utilised nitrous oxide; the remainder of cases had used helium or nitrogen. The two cases are presented here. In case 1, a 48-year-old man was found completely encased in a plastic bag with a hose connected to an opened cylinder of nitrous oxide. In case 2, a 27-year-old woman was found with a plastic bag over her head, tied around her neck, with a tube connected to a small canister of nitrous oxide. There were approximately 20 empty canisters of nitrous oxide nearby. Death in both cases was due to nitrous oxide augmentation of plastic bag asphyxia, manner suicide. The relative ease with which helium and nitrogen cylinders containing large amounts of gas can be obtained may explain the low numbers of suicides utilising nitrous oxide.

Keywords

Nitrous oxide, inert gases, helium, nitrogen, suicide, plastic bag, asphyxia

Introduction

In recent years, a number of publications and websites have given instructions on how to commit suicide. A method which has achieved considerable attention is the use of a plastic bag placed over the head and fastened around the neck, with a tube leading to a canister of inert gas. The gases which are normally promoted are helium, argon and nitrogen.[1,2] However, occasional cases in the literature have been reported involving the use of nitrous oxide.[3,4] Given that there are only isolated case reports in the literature, the following study was undertaken to determine how common – or rare – nitrous oxide inhalation suicides are compared to those where nitrogen and/or helium have been used.

Methods

A study was undertaken at Forensic Science SA (FSSA) from January 2003 to December 2017 of all cases of suicide where helium, nitrogen or nitrous oxide gas had been used. All medicolegal autopsies in South Australia are performed at FSSA under the direction of the State Coroner. The population of the state is currently approximately 1.6 million. The cases of suicide associated with gas (helium, nitrogen and nitrous oxide) inhalation had full police and coronial investigations with autopsies (one was an external examination only) and toxicological assessments. There were no significant underlying organic diseases or injuries present which could have caused or contributed to death. Toxicological evaluations did not reveal significant levels of alcohol or common prescription or non-prescription drugs. All of the deaths involved helium, nitrogen or nitrous oxide gas augmented asphyxia.

Results

Out of a total of 58 cases, there were only two cases of nitrous oxide asphyxia (3.5%). The remainder involved helium (n=33; 56.9%) and nitrogen (n=23; 39.7%), the details of which have been previously published.[5]

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Case 1

A 48-year-old man with a past history of depression, polypharmacy abuse and previous suicide attempts was found dead, lying on his bed at his home address completely encased in a plastic bag. The bag was sealed on the outside around the feet and along the sides, but was sealed from the inside around the head with duct tape. A hose connected the bag to an opened cylinder of nitrous oxide with a sock taped to the bag to seal the entry point of the tube. Duct tape and a pillow were present inside the bag. A suicide note was located next to the bag.

At autopsy, there were no injuries or underlying organic diseases identified which could have caused or contributed to death. Intravenous puncture wounds were noted on the dorsa of both hands, with histology revealing recent haemorrhage with chronic inflammation, fibrosis, haemosiderin deposition, giant cell formation and polarisable foreign body material, indicating previous injection of impure material. Toxicology revealed a non-lethal level of morphine (0.02 mg/L) with a sub-therapeutic level of temazepam. Death was due to nitrous oxide augmentation of plastic bag asphyxia, manner suicide. It was not clear from where the decedent had obtained the cylinder of nitrous oxide. Given the presence of moderate decomposition, head space analysis was not conducted.

Case 2

A 27-year-old woman was found dead, lying on her bed at her home address. She was on her back with a plastic bag over her head fastened around her neck with a zipper and a tied shoelace. A plastic tube ran from the bag to a small canister of nitrous oxide with a whipped cream logo on the side. Adjacent to the body were approximately 20 empty small canisters of nitrous oxide in addition to five full boxes containing 10 full canisters each. No suicide note was located. There was a history of depression and of previous inhalation of nitrous oxide.

At autopsy, there were no injuries or underlying organic diseases identified which could have caused or contributed to death. There was no ligature mark around the neck. Toxicology revealed no alcohol or common prescription or non-prescription drugs. Head space analysis of the lung tissue confirmed the presence of nitrous oxide. Given the scene findings of a plastic bag tied around the neck and the large number of nitrous oxide canisters, death was attributed to nitrous oxide augmentation of plastic bag asphyxia, manner suicide.

Discussion

Methods of suicide vary among communities and countries influenced by accessibility and availability, and also by the understanding of possible lethality. For this reason, types of suicide vary between the very young and older adults.[6,7] Independent of the methods use, however, suicides account for a significant percentage of medico-legal cases.[8]

The Internet has provided a ready source of information on methods that may be used to commit suicide, and it also provides a forum for the discussion of self-termination. It has been suggested that this may facilitate cluster suicides where a significant increase in suicides often using the same methods occurs in individuals who were either known to each other or at least had some form of contact.[9–11] For example, it was proposed that the increase in the percentage of hanging suicides in those younger than 18 years of age in South Australia from 33.3% (1995–1999) to 93.3% (2005–2009) may have been influenced by Internet-based social sites.[10] Suicide pacts have also been facilitated by Internet chat rooms and on message boards, leading to so-called 'net suicides'.[12,13]

Although suicide using plastic bags and gas are uncommon, studies have shown that the numbers of deaths utilising helium have increased in recent years in a number of communities.[14–21] For example, in the United States, non–carbon monoxide gas inhalations, which are mainly helium, increased from 15% to 40% between 2005 and 2012.[21] There is also a possibility that nitrogen may surpass helium use following moves to add oxygen or air to helium canisters to reduce the lethality of the contained gas.[5,22,23] Argon is very rarely used.[24] Previously, it was more common for plastic bags to be used on their own without the addition of inert gases.[25] Although it is possible to detect inert gases using headspace gas chromatography/mass spectrometry,[24] as was done in case 2, this was not undertaken in case 1 due to moderate decomposition.

The current study has, however, shown that there has been no increase in suicides utilising nitrous oxide in the local community over the past 15 years. The total number of cases was only two, representing just 3.5% of 58 cases of gas asphyxia (helium, nitrogen and nitrous oxide), of which helium accounted for 33 (56.9%) cases and nitrogen 23 (39.7%) cases.[5] Nitrous oxide is also a known substance of abuse, as it reduces anxiety and induces euphoria,[26] with accidental deaths rarely occurring after recreational use, sometimes involving autoerotic activities.[27–29] Although nitrous oxide is considered inert, it may, however, cause irreversible inactivation of vitamin B12 with prolonged usage, resulting in anaemia,

leucopoenia and a demyelinating neuropathy.[26,30] The mechanism of death in nitrous oxide inhalation is similar to other inert gases, with asphyxia occurring from displacement of oxygen.

The reasons for the paucity of cases involving nitrous oxide may simply be due to the relative ease of acquisition of the other gases and the lack of promotion on assisted suicide sites. Helium is widely available for the inflation of party balloons, with retail stores dedicated to its sale offering 'jumbo cylinders'. Nitrogen is also not difficult to obtain, as it is used industrially for a variety of chemical processes, as well as in wine making, paint ball guns and food packaging. On the other hand, nitrous oxide is relatively specialised for use as an anaesthetic agent, in chemical laboratories or to enhance engine speed in racing. Although it is available for sale in some 'head shops' for recreational use and is used to dispense whipping cream, the latter is only in small cylinders, and so a large number will be required, as was clearly demonstrated in case 2. Ready accessibility to large amounts of a particular gas may be a significant determinant in the number and type of resultant suicides. If this is the case, then the relative ease with which helium and nitrogen cylinders containing large amounts of gas can be purchased may explain the continuing low numbers of nitrous oxide suicides.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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