G14 Fatal CO2 Suicidal Poisoning

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The goal of this presentation is to recognize that the cause and manner of death requires deliberate consideration, even when the circumstances may lead to an initial obvious, but misleading, direction. It is important to consider the case, the crime scene, and the autopsy findings, especially if the death is non-natural.

This presentation will impact the forensic community and/or humanity by demonstrating an interesting case for the forensic pathologist and forensic toxicologist. It is important that these two disciplines work together and to share the findings to go to the truth.

Introduction: The authors describe a case of suicide in a workplace. A 45-year-old man who worked in a vegetable and fruits packaging business was found dead in his workplace. Because of the scene circumstances, analysis of an arterial blood sample taken with an airtight syringe at the scene revealed absence of carbon monoxide but high levels of carbon dioxide (CO2). Autopsy found no significant injury and police investigators found a handwritten note of intent, describing a recent personal crisis. Therefore the authors concluded that the cause of death in this case was a suicide by carbon dioxide intoxication. This means of suicide is rare, with cases previously described in the literature as accidental carbon dioxide intoxications. This is the first case of suicide by CO2 intoxication within a closed-space tank in which the atmosphere is modified for the package of fruits and vegetables.

Case report: A 45-year-old male who worked as a packager of vegetables was found dead on the floor in his workplace. The location of the death was a confined room used for packaging vegetables, fruits, and apples. External examination showed no sign of struggle and the victim had no history of psychiatric disorders. The rescue team thought that cause of death could be carbon monoxide intoxication. In the residence of the deceased, police investigators found a handwritten note of self-destructive intent, describing a recent personal crisis.

Autopsy findings: An autopsy was performed by a board-certified forensic pathologist. The external examination of the body was significant for an absence of cherry red lividity, which is normally a good indicator of CO intoxication. Autopsy found no significant injury and no traumatic lesion.

Toxicology: Toxicological analysis was carried out, including blood ethanol levels and screening for common drugs and illegal substances. Surprisingly, carboxyhemoglobin was positive only at 2% saturation. The cause of death was unclear. The forensic pathologists had the idea to perform the quantification of PCO2 and PO2 in the arterial blood. An analysis of the airtight arterial peripheral blood sample found an oxygen saturation of 34.1%. The partial arterial CO2 level was 204 mmHg and the O2 38.6 mmHg. The normal range of partial arterial CO2 extends from 40 to 60 mmHg; the normal range of partial arterial O2 extends from 95 to 60 mmHg.

The cause of the death was attributed to asphyxiation caused by CO2 intoxication and especially the depletion of oxygen in the room. The manner of death was determined to be suicide. In spite of a suspected rapid postmortem increase in PCO2 and because of the context of death, assessment of the PCO2 level was performed in this case. The results of the PCO2 were elevated to such a degree, that it was possible to conclude that the cause of death was CO2 intoxication.

Discussion: the mechanisms of toxicity of CO2 are discussed. Carbon dioxide is produced when organic material decomposes or ferments. Asphyxiation from CO2 exposure has occurred in workers entering grain elevators (cereal stocking), the holds of cargo ships, and brewery vats. It occurs accidentally when these spaces are not aerated or ventilated, or when the ventilation system dysfunctions. Sub acute toxicity may be caused by the body's failure to eliminate endogenous CO2, as it occurs in hypoalveolar ventilation resulting from chronic obstructive pulmonary disease, opioid poisoning, or other causes of respiratory failure. Clinical signs of CO2 intoxication are presented and compared with the concentration in mmHg found in this case. Other sources of CO2 exposure are detailed. The most frequently encountered causes of CO2 intoxications are accidental and occur in the occupational setting. Examples of these types of cases are also presented. Deaths by intentional carbon dioxide intoxication are rare. Generally, such cases are suicide by intentional inhalation of automobile exhaust gases with low carbon monoxide emissions within an enclosed garage.

CO2, Occupational Suicide, Asphyxiation

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