Establishment of Identity and Suffocation Following Inhalation of Carbon Monoxide in a Series of Five Cases

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Abstract

A rapid and sudden death in a single incident like mass casualty poses challenge for health care facilities. Especially in such cases, identification of the deceased is the most important task for investigating police officers and doctors. The present study is a seriesof death of five young adult male workers,who died in a tragic fire which broke out in the confined space at under construction plant. All the bodies were rendered unidentifiable from facial recognition due to charring and blackening. Theprimary identification of the deceased was established based upon partially burnt clothes and personal belongings. The autopsy findings being superficial to deep burns, charring and blackening, soot particles inrespiratory tract were similar in all the five victims. The bloodpreserved for estimation ofcarboxy-haemoglobin level showed positive results in all the five cases. Soot in trachea and increased carboxy-haemoglobin level in blood suggested that the persons were alive at the time of incident. In all the five cases, death was caused due to suffocation by inhalation of carbon monoxide gas associated with thermal injuries. Role of forensic experts is to help in the identification of victims and to determine manner and cause of death.

Key words:*Carbon Monoxide Poisoning, Confined Space,Identification, Mass casualty, Suffocation.*

Introduction

On earth, something is always burning, be it wild forest fires started by lightning or by people, controlled agricultural fires, or fossil fuels. When anything made up of carbon whether its vegetation, gasoline or coal burns completely, the only end products left are carbon dioxide and water vapour. But in most of the situations, burning remains incomplete like fires or burning fossil fuels, coal gas, wood stoves, fireplace, furnaces and generators and they produce a mixture of gases including carbon dioxide, carbon monoxide and methane. In Forensic point of view, relevant sources of exogenous carbon monoxide include inferior or faulty heating devices, gas powered engines, motor vehicle exhaust fumes, fire related inhaled smoke and burning charcoal.[1] The incidences of fire related mass casualty in a confined space pose a challenging task for the forensic investigators as well as for the police investigators in terms of establishment of identity of the deceased victims as well as their cause of death. The confined space is a space in which because of its construction, location or contents, the accommodation of a hazardous gas, vapour, dust or fume or the creation of an oxygen deficient atmosphere may occur.[2]

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The present study is a series of death of five young adult male workers who died in a massive fire which broke out in a confined space at an under construction industrial plant and its medico legal significance in terms of identification of victims, cause and manner of death of deceased.

Observations

A massivefire broke out in a confined space of an under construction industrial plant. After extinguishing the fire, the recovered bodies of five adult male workers were brought by the police personnel for autopsy. Complete charring and blackening had left all the five bodies unidentifiable by their facial recognition. The primary identification of deceased was established by personal belongings which was observed on individual deceased as partially burnt clothing, wallet, mobile phones, wrist watch, metallic bangle and backpacks. In the presence of deceased's relatives, the list consisting of names of all the workers who were present in that plant at the time of the incident with their personal effects, cross verification was carried out, thus establishing the identities of all the victims. In each case, samples in form of tooth and piece of sternum bone were preserved for DNA Analysis to confirm the identity.

The external examination of all the five deceased comprised of 100 percent superficial to deep burns with blackening, charring and heat ruptures at places. On internal examination, the lungs were congested and grossly edematous having cherry red discoloration with multiple pin head sized petechial hemorrhages on the inter-lobar surface. Black colored soot particles were seen embedded in tracheal mucosa extending upto main bronchi. The autopsy findings were similar in all the five deceased. During autopsy, the blood sample of each deceased was preserved with a layer of liquid paraffin for detection of carbon monoxide gas, which was positive for carboxy-hemoglobin in all the victims. The lungs from each deceased were preserved in 10 % formalin for histopathological examination which showed congestion with diffuse pulmonary edema and intra alveolar hemorrhages.

The final cause of death for all the deceased was based upon both external and internal autopsy findings, Forensic Science Laboratory Reports, Histopathological Examination Report with circumstantial evidences and was concluded as shock due to burns with suffocation following inhalation of carbon monoxide.

Discussion

In many situations, it is extremely difficult to deal with mass casualty incidents especially related with fires. Intangible loss following death of heirlooms, loved ones to loss in industrial revenue are some of the imperceptible effects of fires which are incompensable. The major challenge faced by the forensic investigators is to establish the identity[3]. The four legally admissible methodologies of identification are visual recognition, dental identification, finger print comparison and DNA typing.[4] RuwanpuraR. et al[5]had reported a case of Bus–Truck Collision with 19 severely burnt bodies and establishment of identities of all severely burnt bodies was done by their personal belongings, parts of clothing and dental characteristics. Similarly in the present case series, the identities of all the five completely charred and unidentifiable bodies were established by their personal belongings and were confirmed by DNA Analysis.

Suffocation is a type of asphyxia which results from deprivation of oxygen either because of lack of oxygen in the environment or inhalation of irrespirable gases or from obstruction of air passages at the level of mouth or nostrils.[6,7]Carbon monoxide build up in toxic concentration in an inadequately ventilated space is potentially hazardous[8]. It is a colourless, odourless, tasteless, non irritant and a chemical asphyxiant gas which is produced by

incomplete combustion of elements made of carbon. Its intoxication is the most common cause of death in combustion related inhalation injuries.[9] Death in such cases usually follows anaemic anoxia due to the decreased oxygen concentration in tissues.[10] Soot has a very heavy concentration of inorganic metalsincluding lead, antimony and its presence along with elevated carbon monoxide saturation are suggestive of the victims being alive at the time of the incident.[11]Zhu BL et al[12] reported five fatalities due to carbon monoxide intoxication accompanied by respiratory distress secondary to inhalation of incomplete combustion gases.Jongcherdchootrakul K et al[13] reported67 deaths due to suffocation at a pub fire in Bangkok.Similarly in the present case series all the five deceased died due to suffocation following inhalation of carbon monoxide gas which was confirmed by presence of carboxyhaemoglobin in blood.

Thus,it is of utmost importance to determine the role of each and every article present at an industrial plant and what role they could play in contributing to inflammability or combustible by products of noxious nature in a fire scene.

Conclusions

Carbon monoxide poisoning has been accepted as one of the leading significant cause of fatalities. To prevent such tragic incidents in future, one must determine the effective fire control and escape plans at the potentially vulnerable industries and should bring about timely necessary changes. Effective fire control systems in form of practical and convenient fire escape plans- emergency exits, fire alarm systems and carbon monoxide detectors to be installed at such places. High rise buildings especially industrial plants to be constructed in a fire resistive and safety manner. Frequent and adequate training of the employees and workers in form of mock drills would prove helpful. Inflammable products to be banned at industrial sites and this could be enforced by regular timely frisking of the employees and workers.

Ethical Clearance – Not Applicable.

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