

Ethylene Oxide Intoxication: A Case Series

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Abstract

Ethylene oxide is a colorless, inflammable, explosive and toxic gas with a slight odor which is slightly heavier than air. It used for sterilization of the materials in healthcare sector and for sterilization purposes in pharmaceutical sector etc. Eight patients including 7 females and 1 male referred to our emergency clinic after ethylene oxide gas leak in sterilization unit of a company. Age average of the patients was 28 (min: 19, max:53) years. Inspection of the patients in the emergency service was nonspecific. Blood analyses of the patients were also nonspecific. The patients were discharged from emergency service by their own request while they were treated in the emergency service. Three patients then referred because of nausea and vomiting 3 days after. Blood analyses performed again were also nonspecific. Physiological saline was administrated for hydration and 4 mg of ondansetron was administrated; the patients were discharged upon recovery of the complaints. The aim of the present study was to present monitoring and treatment of possible intoxication by ethylene oxide which is commonly used in sterilization units.

Key words: Ethylene oxide, Intoxication, Sterilization

Özet

Etilen oksit renksiz, yanıcı, patlayıcı ve hafif bir kokuya sahip, havadan biraz daha ağır olan zehirli bir gazdır. Sağlık sektöründe malzemelerin sterilizasyonu ve ilaç sektöründe sterilizasyon amaçları için kullanılır. 7 kadın ve 1 erkek olmak üzere sekiz hasta, bir şirketin sterilizasyon ünitesinde etilen oksit gazı sızıntısından sonra acil kliniğimize başvurdu. Hastaların yaş ortalaması 28 (en az 19, en çok 53) idi. Acil servisteki hastaların muayenesinde özellik saptanmadı. Hastaların laboratuvar bulgularında özellik yoktu. Hastalar acil serviste tedavi ederken acil servisten kendi istekleri ile taburcu edildi. Üç gün sonra ise hastaların üçü bulantı ve kusma şikayeti ile tekrar acil servise başvurdu. Tekrarlanan kan analizlerinde herhangi bir patolojik bulgu saptanmadı. Hidrasyon amaçlı serum fizyolojik uygulaması yapıldı ve 4 mg ondansetron uygulandı. Hastalar şikayetlerin düzelmesi üzerine taburcu edildi. Bu çalışmanın amacı, sterilizasyon ünitelerinde yaygın olarak kullanılan etilen oksit ile olası zehirlenmelerin izlenmesini ve tedavisini sunmaktır.

Anahtar kelimeler: Etilen oksit, Zehirlenme, Sterilizasyon

Introduction

Ethylene oxide is a colorless, inflammable, explosive and toxic gas with a slight odor which is slightly heavier than air. Ethylene oxide has been discovered in 1859; bacteriocyte characteristics was discovered in World War 2. Ethylene oxide has been used for sterilization since 1960¹. It is also used for sterilization of the materials in healthcare sector and for sterilization purposes in pharmaceutical sector etc. The gas penetrates through inhalation or skin. It is metabolized by two different pathways. The metabolites are excreted in the urine within 24 hours following the exposure. Small portion of the gas is discharged as carbondioxide or small metabolites from gastrointestinal system. Acute or chronic effects due to ethylene oxide toxicity were reported in animal and human experiments. The aim of this study was to present monitoring and treatment of possible intoxication by ethylene oxide which is commonly used in sterilization units.

Cases

Eight patients including 7 females and 1 male referred to our emergency clinic after ethylene oxide gas leak in sterilization unit of a company by emergency ambulance at 3:00 p.m. so Ethylene oxide poisoning has been set with anamnesis of patients and no diagnosis test has been performed. Age average of the patients was 28 (min: 19, max:53). Glasgow Coma Score (GCS) was 15, pupils were isochoric and vital signs were within normal limits during inspection of 8 patients in the emergency service. Common complaint of the patients were nausea. There was not any pathology detected in the ECG and physical examination of the patients was normal. Blood count, biochemistry and urine analysis of the patients were normal. Hydration was performed by intravenous infusion of 1000 ml isotonic and 10 mg metochlopramide within 100 ml of isotonic fluid for nausea. Intoxication Hotline, 114 was contacted for ethylene oxide intoxication

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and a follow-up for 48 hours was planned; however, the patients expressed that they felt well and were discharged by their own request. Three female patients referred emergency service again upon recurrence of nausea 3 days after. Physical examination was repeated again and it was nonspecific. Blood count, biochemistry and urine analysis of the patients which were repeated were normal. Hydration was performed by intravenous infusion of 1000 ml isotonic and 4 mg ondansetron was administered within 100 ml isotonic solution. There was not any specific finding during follow-up and complaints of the patients regressed; the patients were discharged after arrangement of their medical treatments.

Discussion

Ethylene oxide is a gas used for sterilization of heat-sensitive materials². Security precautions must be taken in the units where ethylene oxide is used for sterilization; the areas where tubes, cartridges and sterilizers are kept must be controlled by sensors⁵. The exposure level allowed for ethylene oxide is 1 ppm per eight hours^{3,4}. Acute or chronic effects due to ethylene oxide toxicity were reported in animal and human experiments^{3,4}. Early symptoms of acute over-exposure to ethylene oxide include nausea, vomiting, headache, irritation on eyes and respiratory tracts. The individual may feel a strange taste in the mouth¹. All 8 patients had nausea complaint. Nevertheless, three patients referred to emergency service upon persistence of nausea complaint. Pulmonary edema, somnolence, weakness and incoordination may appear as late finding. The aforementioned findings were not detected in 8 patients. The outcomes of the researches suggest that changes in the blood cells and spontaneous miscarriages may be associated with exposure to ethylene oxide. Pregnancy was not detected in the tests performed on female patients. Skin contact of liquid and gas forms of ethylene oxide may cause burn and allergic reactions. Edema and erythema appeared on the skin transforms to bulla and desquamation. Recovery is completed within three weeks. However, brown pigmentation may persist. Ethylene oxide solutions of 40% to 50% are very dangerous. It causes diffuse bullas even after short contact. Pure liquid ethylene oxide causes freezing. On the contrary, eyes are relatively insensitive to ethylene oxide. However, some corneal irritation may appear¹. Sterilization by ethylene ox-

ide is still important; and labor safety precautions should be kept at highest priority due to its toxicity; an emergency precaution action plan should exist in workplaces in case of any leak. However, patient's occupation should be investigated during history taking and the emergency medicine physician should consider leak of ethylene oxide when a patient refers from a workplace using ethylene oxide.

Conclusion

Ethylene oxide is a colorless toxic gas. This gas is commonly used for sterilization; and labor safety precautions for ethylene oxide gas should be taken seriously for ethylene oxide gas and the patients should be closely followed for severe adverse events in case of a leak; workplace of a patient with complaints of nausea etc. should be investigated and gas exposure such as ethylene oxide should be considered by emergency physician.

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