Death Due to Combined Intake of Ethanol and Toluene: a Case Report

Murat Seradar GÜRSES\textsuperscript{a}; Nursel TÜRKMEN\textsuperscript{a,b}; Bulent EREN\textsuperscript{b}; Selcuk ÇETİN\textsuperscript{a}; Umit Naci GÜNDOĞMUŞ\textsuperscript{c}

\textsuperscript{a}Department of Forensic Medicine, Uludag University Medical School, Bursa, Turkey
\textsuperscript{b}Bursa Branch of the Council of Forensic Medicine of the Ministry of Justice, Turkey
\textsuperscript{c}Institute of Forensic Medicine, Istanbul University, Istanbul, Turkey

**ABSTRACT**

Toluene is a commonly used volatile organic chemical in industry and is the most often chosen illicit substance among volatile substance abusers. Studies involving healthy volunteers suggest that ethanol consumption inhibits toluene metabolism, thus increasing its blood levels. In this study, a lethal case of combined ethanol consumption and toluene inhalation has been reported. Our case was a 30-year-old male who had used volatile substance for 15 years. The autopsy revealed no abnormal findings. Toxicological analysis revealed alcohol and toluene in the blood and the cause of death was considered as toxicity due to acute combined intake of alcohol and toluene. Lethal combined ethanol and toluene intake is rarely reported in the literature. Experimental studies indicate that toluene increases the risk of ethanol dependence and each substance increases the toxic effects of the other.

**Keywords:** alcohol, toluene, toxicity, autopsy

**INTRODUCTION**

Toluene is a commonly used volatile organic chemical in industry and is the most often chosen illicit substance among volatile substance abusers. Harmful effects of toluene involve central nervous system and heart in the first place. Death usually results from these toxicities (1). Experimental studies indicate that ethanol use increase toluene toxicity and toluene exposure potentiates ethanol dependence (2,3). Studies involving healthy volunteers suggest that ethanol intake inhibits toluene metabolism, thus increasing its blood levels (4). Herein, we present a lethal case of combined ethanol intake and toluene inhalation.

**CASE REPORT**

The case is a 30-year-old male. The family of this person reported that he had begun using volatile substance while he was 12-15 years old, they had not known the exact frequency and dosage of his usage, and that he had not agreed to be treated. The external examination of the autopsy revealed multiple crustaceous burn scars measuring 4x2.5 cm on the right eyebrow, 2x1.5 cm on the outer side of the right eyebrow, 1x1 cm on the right side of the zygomatic arch, 3x1 cm on the left eyebrow, 1x1.5 cm on the left zygomatic arch, 2x1 cm on the right side of the nasal surface, an extensive one on the nose tip, 19.5x5 cm beginning from under the right ear-passing over...
the mental zone and finishing on the left mandibular ramus, 3.5x3 cm on the left side of the neck; psychopathic incision scars on the arms, chest and abdomen; a vertical operation incision scar measuring 5.5 cm between the epigastrium and umbilicus. There were no abnormal findings in the internal examination. Chemical substance analysis revealed 0.73 promille alcohol and 8 μg/ml toluene in the blood and the cause of death was considered as toxicity due to acute combined intake of alcohol and toluene.

DISCUSSION

Toluene is an aromatic hydrocarbon and is generally used as paint thinner. The legal formula of paint thinner is 90% toluene, 9% ethyl acetate and less than 1% benzole in our country and adhesive substances contain 94% toluene as their main solvent (5). Toluene is one of the most commonly used illicit volatile substances because of its euphoric effect and easy accessibility. In the study of Kendirli at al toluene was the most commonly used volatile substance (5). The study of Ögel K et al in adults below 21 years of age, living on the street revealed that 84% were males and frequency of volatile substance use was 73% (6). Another study of Öget K et al. showed that among second-year high students, frequency of volatile substance use was 5% (7). Lethal combined ethanol and toluene intake is rarely reported in the literature. Experimental animal studies indicate that ethanol increased the protein synthesis inhibitory effect of toluene (8). Volatile substances have cardiotoxic effects. The study of Cunningham et al suggests that long term toluene inhalation may cause myocardial infarction and ventricular fibrillation related to coronary vasodilation (9). The report of Vural et al regarding a case with a ten year history of volatile substance abuse presenting with ventricular arrhythmia associated with dilated cardiomyopathy is in line with this suggestion (10). The study of Halifeoğlu et al in workers exposed to thinner inhalation suggest that thinner is oxidized by cytochrome p-450 enzymes and free radicals are released and cause cytotoxicity in several organs (11). They also reported that malondialdehyde, a product of fat peroxidation, is increased in blood while antioxidant enzymes glutation peroxidase and superoxide dismutase are increased in the erythrocytes (11). The results of the study of Garbe et al suggest that free radicals disrupt cellular functions and have a role in various cardiovascular disorders like atherosclerosis, cardiac hypertrophy and hypertension (12). Ethanol has well known toxic effects on the nervous system and the heart like toluene. Experimental studies indicate that toluene increases the risk of ethanol dependence and each substance increases the toxic effects of the other (2-4). Thus, combined use of these substances possibly increases the risk of lethal toxicity. The most dramatic consequence of volatile substance inhalation is the "sudden sniffing death syndrome (SSDS)" (1). Cardiac toxicity constitutes approximately half of deaths related to SSDS (13-16). The autopsy of victims of SSDS generally reveals no pathological findings (14). Likewise, we did not any pathological findings in the autopsy of our case. While in some cases, volatile substances lead to pronounced myocardial ischemic damage, cardiomyopathy has also been identified in some cases. The main cause and mechanism of these situations caused by volatile substances have not been understood clearly. However, in several studies suggested that various factors may be responsible for his situation such as dosage, exposure time of the volatile substances and environmental and genetic factors that increased risk of the cardiotoxicity (10). Vural et al have been suggested that sudden deaths due to volatile substances occur as a result of multiple organ toxicity rather than only a cardiotoxicity (1). Among important risk factors for toluene use are poverty, discrimination, neglect, and violence in families and working in businesses in which volatile substances are used (17). In the early stages euphoria and aggressive behaviors are seen which may be followed by abstinence symptoms. In our country, legal precautions went in effect in 16 May 2009 to prevent children and the young from accessing volatile substances (18). The most effective means of protection from volatile substances would be through a good education and family structure to avoid the first acquaintance with them. Taking into account all of these, national and educational measures to prevent this potentially lethal illicit substance use is crucial.

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REFERENCES