Panceratic Complications of Mustard Gas Exposure: A Study on Cadavers

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Received: 24.01.2015 *Accepted: 10.03.2015*

ABSTRACT

Background: Sulfur mustard is one of the chemical warfare gases that has been known as a vesicant or blistering agents. It is a chemical alkylating compound agent that can be frequently absorbed through skin, respiratory system, genital tract, and ocular system. This study was done to pathologically analyze the microscopic pancreatic lesions in cadavers.

Methods: This case series study was performed during 2007 to 2012 in Legal Medicine Organization. Exposure was confirmed by the written reports of the field hospitals, based on acute presentation of eye, skin and pulmonary symptoms of the exposure.

Results: Pancreatic autopsy findings were chronic inflammation, fibrosis and duct ectasia; acinar atrophy was also seen in 4 cases. All 4 cases had chronic pancreatic disease with abdominal pain, steatorrhea and weight loss that was confirmed by sonography. CT scan and Endoscopic Retrograde Cholangio-Pancreatography (ERCP) have also demonstrated the chronic pancreatitis.

Conclusion: According to the chronic progressive lesions caused by mustard gas exposure such as pulmonary lesions and also its high mortality rate, suitable programming for protection of the mustard gas exposed people in chemical factories is necessary.

Keywords: Autopsy; Lung Injury; Mortality; Mustard Gas.

IJT 2015; 1287-1289

INTRODUCTION

Mustard gas (sulfur mustard), is a vesicating agent that had been made in 1821 and used on troops fighting in the World War I [1]. Sulfur mustard is one of the chemical warfare gases that has been known as a vesicant or blistering agents [2]. This gas has been used during the Iran–Iraq war (1980-88) and over 100,000 poorly protected soldiers suffering severe and debilitating injuries as a result; roughly 45000 soldiers continue to suffer long-lasting consequences of exposure [3-5].

Mustard gas is a chemical alkylating compound agent that can be frequently absorbed through skin, respiratory system, genital tract, and ocular system. The first acute manifestations of mustard gas exposure are occurred in ocular system with threshold symptoms of tearing and irritation, respiratory tract with the damage to the terminal airways, and skin as erythematic or necrotic lesions [6, 7]. Also, respiratory problems are the greatest cause of long-term disability among these patients that are manifested as asthma, bronchiectasis, large airway narrowing, and pulmonary fibrosis [8, 9]. This gas has been also known as a DNA alkylating agent and categorized as carcinogens [10].

Several previous studies have considered the clinical manifestations and prognosis of patients who exposed to mustard gas, however, no studies have been done to assess pathological changes of the pancerace in cadavers. This study was done to pathologically analyze the microscopic pancreatic lesions in cadavers.

MATERIALS AND METHODS

This case series study was performed during 2007 to 2012 on Legal Medicine Organization hospital recorded files. Records of 100 cadavers that were documentary exposed to sulfur mustard gas during the Iran–Iraq war and

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autopsied in Legal Medicine Organization in Tehran City, Iran, was entered the study.

Exposure was confirmed by the written reports of the field hospitals, based on acute presentation of eye, skin and pulmonary symptoms of the exposure. In all patients, respiratory symptoms which were immediately began after exposure to sulfur mustard gas were evaluated and continued with the pathological findings of autopsied pancreatic changes.

RESULTS

All 100 cadavers were male and 37 of them (37%) were in the range of 40 to 50 years old. The mean age of studied cadavers was 43.6±0.3 years old and the time interval between the gas exposure and death was almost 20-25 years.

Pancreatic autopsy findings were chronic inflammation, fibrosis and duct ectasia; acinar atrophy was also seen in 4 cases. All 4 cases had chronic pancreatic disease with abdominal pain, steatorrhea and weight loss that was confirmed by sonography. CT scan and Endoscopic Retrograde Cholangio-Pancreatography (ERCP) have also demonstrated the chronic pancreatitis.

DISCUSSION

The complications of mustard gas exposure have been studied pathologically on cadavers. Chronic pancreatitis, which is a complex process, implies the presence of irreversible and permanent fibrosis often with acinar cell inflammation, damage to nerves, and loss of ducts [11]. There are several etiological causes for chronic pancreatitis, e.g. toxic, metabolic (alcohol, tobacco smoking, hypercalcemia, etc.), genetic, and autoimmune. The gas can destroy individual cells By Reaction with cellular proteins, especially in the lungs, resulted in acute and chronic complications.

Pancreatic stellate cells (PSC) are believed to play an important role in maintaining normal pancreatic architecture that can shift toward fibrogenesis in the case of chronic pancreatitis. It is believed that alcohol or additional stimuli lead to matrix metalloproteinase mediated destruction of normal collagens in pancreas collagen by pro-inflammatory cytokines, e.g. TNFα and TL-1 [12, 13].

The effect of mustard gas can be similar to pulmonary changes in cancer and this gas may cause to destroy individual cells by reaction with cellular proteins, especially in the lungs, resulted in acute and chronic pulmonary complications such as pulmonary fibrosis [14, 15].

CONCLUSION

According to the chronic progressive lesions caused by mustard gas exposure such as pulmonary lesions and also its high mortality rate, suitable programming for protection of the mustard gas exposed people in chemical factories is necessary. Also, all government should step towards prohibiting chemical warfare.

ACKNOWLEDGMENT

The author would like to thank AJA University of Medical Sciences and all colleagues for their important technical and clinical support.

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