akademik acil tıp dergisi

Factors Affecting Mortality in Endosulfan Ingestion With Suicidal Intent

Özkıyım Amaçlı Alınan Endosulfanda Ölümü Etkileyen Faktörler

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Abstract

Objective: Most pesticides containing Endosulfan have either been restricted or prohibited due to the fact that they remain active longer in nature, and have a long half-life and mid-level toxicity in the body. Acute or chronic exposure to Endosulfan, which may be life-threatening or at times fatal, has rarely been reported. Our aim was to analyze the affective factors of endosulfan toxicity on clinical findings and mortality cases.
Materials and Methods: In the study, all patients who called upon the emergency service due to suicidal endosulfan ingestion were retrospectively analyzed. Twenty-seven patients over the age of 15 years with definite proof that they used medicine containing an endosulfan substance were included into the study.
Results: The average age of our patients was 26.56±13.6 years (15-68). The number of male patients was 10 (37.1%), while that of female patients was 17 (62.9%). There were 17 patients (62.9%) who presented with nausea and vomiting complaints, 12 (44.4%) patients with seizure, and 15 (55.5%) with loss of consciousness. The 5 patients who died had loss of consciousness and seizure, and required mechanical ventilation support during seizure and follow-up. In the surviving group, however, loss of consciousness was detected in 10 patients, seizure during follow-up in 5, and ventilation support was required in 5 patients.
Conclusion: Loss of consciousness following suicidal endosulfan ingestion, seizure on arrival and/or during follow-up and need for mechanical ventilation support were the factors which affected mortality. *(JAEM 2010; 9: 158-60)*
Key words: Endosulfan, mortality, emergency service, suicide

Received: 02.04.2010 **Accepted:** 05.04.2010

Özet

Amaç: Endosülfanların birçoğu, insan vücudundaki uzun yarılanma ömrü ve orta derecede toksisitesi nedeniyle kullanımı sınırlandırılmış ya da yasaklanmıştır. Hayatı tehdit edici hatta zaman zaman öldürücü olabilen endosülfana akut ya da kronik maruziyet nadiren rapor edilmiştir. Amacımız literatürde az bulunan endosulfan zehirlenmesi vakalarını analiz etmek, klinik bulgu ve mortalite üzerine etkili faktörleri araştırmaktır.
Gereç ve Yöntemler: Çalışma için acil servise intihar amaçlı ilaç alım ile başvuran tüm hastalar geriye dönük olarak analiz edildi. Bu hastalar içerisinden endosülfan maddesi içeren ilaç aldığına dair kesin kanıt elde edilen 15 yaş üstü 27 hasta çalışmaya dahil edildi.
Bulgular: Hastalarımızın yaş ortalaması 26.56±13.6 yıl idi. Hastaların 10'u erkek (%37.1) 17 (%62.9)'si kadındı. Bulantı kusma şikayeti ile başvuran 17 (%62.9), nöbet geçiren 12 (%44.4) hasta, şuur kaybı ile başvuran 15 (%55.5) hasta vardı. Ölen 5 hastanın 5'i de şuur kaybı, nöbet geçirme, takip esnasında nöbet ve mekanik ventilasyon ihtiyacı gelişti. Sağ kalan hastalarda ise 10 hastada şuur kaybı, 5 hastada takip esnasında nöbet ve 5 hastada mekanik ventilatör ihtiyacı saptandı.
Sonuç: Özkıyım amaçlı endosülfan alımında şuur kaybı, geliş anı ve/veya takip esnasında nöbet geçirme ve mekanik ventilatöre ihtiyaç duyma mortaliteyi etkileyen faktörlerdir. *(JAEM 2010; 9: 158-60)*
Anahtar kelimeler: Endosulfan, mortalite, acil servis, özkıyım

Alındığı Tarih: 02.04.2010 **Kabul Tarihi:** 05.04.2010

Introduction

Organochloride insecticides are chloride cyclic hydrocarbons with a weight of 300- 550 daltons (1). Endosulfan is one of these insecticides, (6, 7, 8, 9, 10-10 hexachloro 1, 5, 5a, 6, 9, 9a-hexahydro-6-methano-2, 4, 3-hexadithioxanthiepin 3-oxide), and is commonly used in agriculture. Although they only have class 2 toxivcity(middle-grade poisonous matters), endosulfan is the most toxic organic chloride. It is almost non-curable and is highly mortality-related in humans (2).

As most endosulfans remain active for a long time in nature, and have a long half -life in the human body and medium degree of toxicity, their use is restricted or banned in the USA and Europe (3, 4). These medicines are used in pesticide control, and become active through ingestion, inhalation or absorption through the skin both in humans and animals. Chronic or acute exposure to endosulfan causing mortality is rarely reported (5). Although the physical, chemical and toxic effects of organic chlorine compounds are well defined in the literature, there are few reports of exposure in humans (6). In

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10.5152/jaem.2010.004

most clinical studies, endosulfan is reported to affect the liver, kidneys and heart (7). Characteristically, acute period Central Nervous System (CNS) toxication indications start after intake. Nausea, vomiting, stomach-ache, paresthesia of the face, tongue and extremities, seizure, head-ache, agitation, confusion, hyperactivity, discoordination, dizziness and myoclonus can be observed (8, 9).

Our aim was to analyze instances of suicidal endosulfan intoxications, which are rare in the literature but frequently seen in our region, and to examine the factors affecting clinical findings and mortality cases.

Material and Methods

All patients who were admitted to the Emergency Service of the Medical Faculty of Dicle University between January 2006 and March 2009 with suicidal ingestion of medicines were retrospectively examined. Twenty-seven patients over the age of 15 years with proof that they used medicine containing endosulfan were included in the study. The judicial registry of the box or the name of the pesticide ingested by the patient,communicated to us either by the patient himself or by his relatives, was taken as basis for definite proof. All patient blood samples had been sent to the laboratory for toxicologic screening.

Retrospectively surveyed files were registered in standard forms. Age, gender, demographic data, laboratory data [white blood cell (WBC), alanine transaminase (ALT), aspartate transaminase (AST), glucose, urea, creatinine (Cre), arterial blood gas (ABG), prothrombin time (PTT), presence of seizure, seizure improvement during follow up, mechanical ventilation requirement, period of stay in hospital and patient results were evaluated. The patients were divided into two groups; the surviving group and deceased groups.

Results are given as mean+SD. Univariate statistical analyses were made by the chi-square test for categorical variables and student t-test for constant variables. $p<0.05$ was accepted as statistically significant.

Results

The average age of our 27 patients was 26.56±13.6 years (15-68). 37.1% (n=10) of our patients were male, while 62.9% (n=17) were female. Of the surviving group, 15 were female and 7 were male, and the average age was 24.91±11.49 years. Of the deceased group, 2 were female and 3 were male, and the average age was 33.90±20.70 years. There were no statistically significant differences with respect to gender and age averages.

On admission, 62.9% (n=17) of our patients were suffering from nausea and vomiting, 44.4% (n=12) had convulsions and 55.5% (n=15) had lost consciousness. When complaints on admission are examined, 16 out of 17 complaints of nausea and vomiting were from the surviving group, and only 1 was from the deseased group. On admission, there was loss of consciousness and convulsions in all patients in the deceased group. They had repeated convulsions during follow up and had a greater need for ventilation. In the surviving group, however, 10 patients had loss of consciousness, 7 had convulsions, 5 had convulsions during follow up, and 5 patients were identified with a need for mechanical ventilation. When the two groups were compared for loss of consciousness, the presence of convulsions on presentation, convulsions developing during follow up and the need for mechanical ventilation, these factors were found to be statistically significant (Table 1).

Surviving and deceased patients' laboratory results are shown in Table 2. The serum of all patients was positive for endosulfan. However, endosulfan levels could not be measured.

Discussion

During the last few decades, agricultural pesticides have become a common problem for households in the rural areas of developing countries. As they are easy to obtain, pesticides have been commonly used for deliberate poisoning. Studies carried out during the last years point to about 300 000 mortality cases (2).

Organochlorous pesticides are divided into four groups according to their chemical structures and similar toxicities. However, their toxic symptoms show intra-group identity in humans (3). Endosulfan is a polychloroid hydrocarbon pesticide which is used in agriculture. Its acute toxicity may cause permanent neurological damage (10). Its main toxicological effect is excessive stimulation of the CNS through calcium and magnesium ATPase inhibition and by antagonizing the chlorine ion channels in GABA receptors (2).

The clinical effects of endosulfan intake become manifest after approximately 6 hours. The reason for this rapid onset is its rapid absorption and distribution in lipophilic stores contained in the CNS. Although its plasma half-life is short, its slow redistribution in the circulation causes its effective period to extend to several days (11, 12). A strong odor of sulfur is formed in endosulfan poisonings and the progression is in 3 stages: a sub-acute pulmonary and convulsive period followed by an acute cardiac and convulsive period, and finally a slow recovery period (13).

Table 1. Complaints and need for mechanical ventilation by groups

Clinical Characteristics	Surviving Group n (%)*	Deceased Group n (%)*	p
Loss of Consciousness	10 (45.4%)	5 (100%)	0.046
Convulsions on admission	7 (31.8%)	5 (100%)	0.010
Convulsions during follow up	5 (22.7%)	5 (100%)	0.003
Mechanical ventilation	5 (22.7%)	5 (100%)	0.003

Table 2. Average biochemical parameter values of patients

Biochemical parameters	Surviving Group	Deceased Group	p
WBC (K/UL; mean±SD)	17229.1±5699.4	3160.0±6927.3	0.131
Glucose (mg/dL; mean±SD)	147.77±68.70	159.00±145.56	0.87
Urea (mg/dL; mean±SD)	25.34±8.30	32.40±8.11	0.13
Cre (mg/dL; mean±SD)	0.63±0.18	1.11±.2.18	0.005
AST (U/L; mean±SD)	34.28±27.09	222.20±290.06	0.221
ALT (U/L; mean±SD)	21.56±9.96	67.20±53.47	0.129
pH	7.296±0.186	7.102±0.253	0.166
pO2 (mmHg; mean±SD)	92.49±20.63	61.94±11.95	0.001
pCO2 (mmHg; mean±SD)	37.10±8.39	50.34±22.21	0.256
sO2 (%; mean±SD)	94.78±3.07	76.06±16.01	0.059
HCO3 (mmol/L; mean±SD)	20.67±6.10	16.70±4.48	0.136
Lactate (mg/dL; mean±SD)	24.70±32.43	44.86±30.27	0.231
PT (sec; mean±SD)	15.20±3.80	19.76±7.80	0.265

Characteristic clinical findings following acute poisoning are CNS problems and excessive CNS stimulation. These findings are seizure, nausea, vomiting, abdominal pain, hyperesthesia of the face, mouth, tongue and extremities, headache, agitation, hyperactivity, discoordination, confusion, dizziness and myoclonus (1, 2, 6, 14). Convulsions are common and serious findings (15). The first indication of toxicity can be a single convulsion with no prodromal symptom at all. Symptoms may appear 1-2 hours after intake on an empty stomach or 5-6 hours after intake on a full stomach. Strong stimulation from outside and excessive responsiveness may increase muscle fasciculations towards the development of convulsions and tonic spasms (9). Finally, we encountered nausea and vomiting in our cases. Convulsions and loss of consciousness followed. Convulsions and loss of consciousness were symptoms statistically affecting mortality.

Endosulfan treatment is generally a supportive treatment as there is no specific antidote. Water and soap decontamination of the skin, gastric lavage, active charcoal, colestiramine, and treatment for convulsion and dysrhythmia are among applicable treatments. Colestiramine discharges endosulfan from the enterohepatic circulation and increases elimination (13). Hemoperfusion is reported to be ineffective (11). However, in a case presented by Yavuz Y et. al., biocarbonated hemoperfusion was reported to be useful in patients with acidosis (9). Much consideration was given to methods of decontamination in our cases. Gastric lavage was applied to patients who were conscious on admission and during the first hour, or to those who were provided with a safe air passage through intubation, and 1gr/kg active charcoal was given. Hemoperfusion was not applied to any of our patients.

Endosulfan is quite toxic to the liver, kidneys and lungs, and in high doses can cause rhabdomyolysis. Generally, the toxic affects are seen as completely reversible (1). Elevated AST, ALT and LDH are found in acute pesticide poisonings, and hyperglycemia, leucocytosis and thrombocytopenia may also be seen (1, 6, 16). Hypoxia, metabolic acidosis and lactic acidosis can be found in the arterial blood gas examination of patients (10, 16). Leucocytosis, hyperglycemia and metabolic acidosis were evident in all our cases. Although incoming ALT and AST values were found not to be statistically significant, they were higher in nonsurviving patients. Again, there was a subclinical increase in the non-formation of disseminated intravascular coagulopathy or hemorrhagic tableau in prothrombin time (PTT) values.

Endotracheal intubation and mechanical ventilation can be used for air passage protection and prevention of aspiration. In the case of a myocardium sensitized to organic chlorine, atropine, epinephrine, dopamine and noradrenalin must be avoided (13). Seizures must be kept under control with benzodiazepines, and if seizures continue phenobarbital can be used subsequently. Fenitoine is probably less effective in these cases, as it increases the effect of endosulfan in GABA receptors (3, 6). Repeated convulsions occurred in ten patients during the follow up. These were brought under control with Diazepam, Phenobarbital or Pentothal. Pulmonary toxicity related to endosulfan poisoning has been reported as an important clinical condition (1). In a study by Polat et al., there was respiratory insufficiency and convulsion in one patient admitted to the emergency service. Mechanical ventilation was applied because of respiratory insufficiency, and repeated convulsions in 4 patients were followed up in the intensive care unit (17). Ten of our patients needed mechanical ventilation due to respiratory insufficiency and repeated convulsions. It was found that the need for mechanical ventilation and repeated convulsions had a significant effect on mortality.

Intake of endosulfan can either be accidental or suicide-oriented. Mortality is high especially with suicide-oriented intake (6, 16). Mortality can be seen within hours or days due to treatment-resistant convulsions, multi-organ damage and cerebral edema (12). Mortalities are generally related to pulmonary aspiration, cardiac insufficiency, edema and multiorgan insufficiency. All our patients were of the suicidal endosulfan ingestion group. Three patients died of respiratory failure and 2 died of multiorgan insufficiency.

Conclusion

Loss of consciousness in suicide-oriented endosulfan ingestion, the presence of convulsions and the need for mechanical ventilation at the time of admission and during follow up are factors affecting mortality.

Conflict of Interest

No conflict of interest is declared by the authors.

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