

THE EFFECTS OF ETHANOL ON THE EVOLUTION OF THE ACUTE ORGANOPHOSPHATE POISONING

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Abstract: The co-ingestion with ethanol in the case of patients intoxicated with organophosphoric substances (OPS) involves difficulties in the treatment management, due to the exacerbation of suppressive effects of OPS on the respiratory function. Chronic alcoholism adds other causes: tachycardia and delirium complicate the administration of atropine; ethanol-induced myopathy increases the risk of cardiac complications after the administration of atropine. Material and method: we analyzed retrospectively the patients intoxicated with organophosphoric insecticides admitted in the Internal Medicine Clinic – Toxicology between 2003– 2009. Results: 137 patients with organophosphate poisoning were admitted, 65 were tested by alcohol testing, evidencing values of 1-370 mg/dl. A very weak direct correlation was registered between the alcohol concentration in the blood and the level of cholinesterase, but higher values of alcohol level were associated with lower levels of cholinesterase. Out of 7 deceased patients, 6 showed ethanol co-ingestion.

Cuvinte cheie:
intoxicație cu substanțe organo-fosforice, etilism, colinesteraza

Rezumat: Coingestia de etanol la pacienții intoxicați cu substanță organo-fosforică determină dificultăți în managementul acestora, datorită exacerbării efectelor supresive ale SOF asupra funcției respiratorii. Etilismul cronic adaugă și alte cauze: tahicardia și delirium complică administrarea de atropină, miopatia etanolică crește riscul complicațiilor cardiace post administrare de atropină. Am analizat retrospectiv pacienții intoxicați cu insecticide organo-fosforice, internați în Clinica Medicină Internă-Toxicologie în perioada 2003-2009. Rezultate: au fost internați 137 pacienți cu intoxicație cu substanță organo-fosforică, 65 au fost testați prin măsurarea alcoolemiei, obținându-se valori între 0-370 mg/dl. S-a evidențiat o foarte slabă corelație directă între concentrația de alcool din sânge și nivelul colinesterazei, însă, valorile mari ale alcoolemiei s-au asociat cu nivele mai reduse ale colinesterazei. Din 7 pacienți decedați, 6 au prezentat coingestie de etanol.

INTRODUCTION

Organophosphoric substances (OPS) are insecticides that are frequently used in agriculture, gardening and in veterinary purposes. From the point of view of the chemical structure, there are numerous classes of organophosphoric insecticides, but all of them share the effect of inhibiting the cholinesterase (enzymes able to annihilate acetylcholine). This leads to an accumulation of acetylcholine in the body which is responsible for the symptomatology determined by the action on the muscarinic and nicotinic receptors. (11)

The confirmation of the OPS intoxication is done by the dosage of the plasmatic pseudocholinesterase and of the erythrocyte acetylcholinesterase. The depression of the plasmatic cholinesterase occurs from several minutes to several hours from the OPS ingestion and continues from several days to several weeks. Erythrocyte acetylcholinesterase does not decrease right after the ingestion, but remains low up to 1-3 months.(5, 7)

Under certain conditions, the activity of the erythrocyte cholinesterase decreases even in the absence of the chemical inhibition. 3% of the people have a low level of plasmatic pseudocholinesterase genetically determined.

The patients with hepatitis, cirrhosis, malnutrition, chronic alcoholism and dermatomyositis have low values of plasmatic cholinesterase. (8)

Many of the patients intoxicated with OPS show

alcohol coingestion. This renders the treatment management more difficult, complicating the intoxication with OPS, due to the exacerbation of the suppressive effects of OPS on the respiratory function.(1)

Chronic alcoholism adds other causes: tachycardia and delirium complicate the administration of atropine; ethanol-induced myopathy increases the risk of cardiac complications after the administration of atropine.

THE AIM OF THE STUDY

The complex evaluation of the consequences of chronic and acute alcoholism on the evolution of the acute intoxications with organophosphoric insecticides and the description of the clinical and paraclinical evolutive particularities of these patients.

MATERIAL AND METHOD

The research included 218 patients intoxicated with OPS, assisted in the Internal Medicine Clinic – Toxicology and ATI of the Clinical Emergency Hospital from Iasi, between 2003–2009.

Based on the clinical and paraclinical investigations of the patients under study we attempted to show the influence of chronic or acute alcoholism, as a risk factor, on the health status of the population. The data were loaded and interpreted using statistic functions from EXCEL, EPIINFO and SPSS.

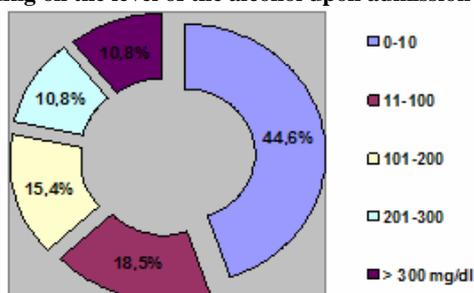
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RESULTS AND DISCUSSIONS

Out of the total number of patients intoxicated with organophosphoric substances, 47,4% were tested for the alcohol level. The level of the alcohol varied from 1 and 370 mg/dl.(fig.1)

Figure no. 1. Distribution of the patients from the OPS lot depending on the level of the alcohol upon admission

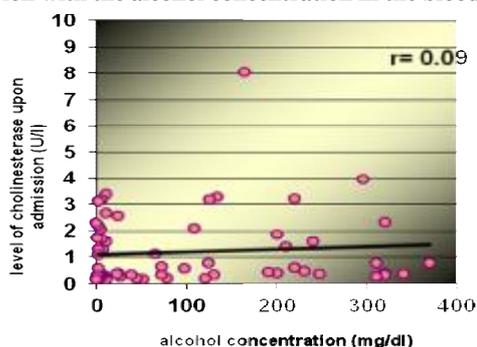


By comparing the distribution of the patients with alcohol level above the normal limit, depending on the epidemiologic characteristics, the following aspects stand out:

- The number of male patients (38/66) with values over the limit was significantly higher than the number of female patients (26/71) ($p=0.022$);
- The average values of the alcohol level registered with female patients ($110,31 \pm 61,56$ mg/dl) were significant lower than with male patients ($135,55 \pm 67,58$ mg/dl) ($t=2,28$; $GL=135$; $p<0,05$);
- The average values of the alcohol level registered with the patients from urban environment ($72,37 \pm 52,82$ mg/dl) were significant lower than in the case of patients from rural environment ($111,82 \pm 60,34$ mg/dl), ($t=4,05$; $GL=135$, $p<0,001$).

In the case of patients with alcohol coingestion, the level of cholinesterase upon admission in relation to the alcohol concentration in the blood evidenced a slight direct correlation between the alcohol level in the blood and the level of cholinesterase ($r=0.09$), but we need to point out the fact that, higher levels of alcohol level were associated with lower levels of cholinesterase. (Fig. 2)

Figure no. 2. Correlation of the cholinesterase level upon admission with the alcohol concentration in the blood



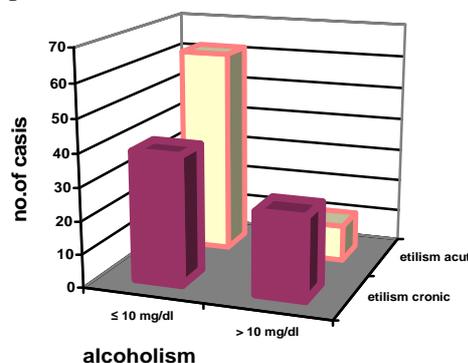
The average values of cholinesterase on hospital leave, in the lot of patients with OPS intoxication with alcohol coingestion increased significantly from 1,21 to 3,07 U/l ($p<0.001$).

From the anamnesis, in the case of the patients with alcohol coingestion from the OPS lot we identified a percentage of 46,7% of cases with chronic alcoholism.

The number of cases with chronic alcoholism, with values of the alcohol level over the normal limit upon admission

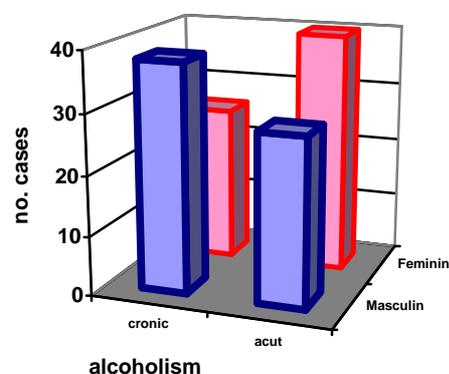
(25/64) was significantly higher than in the cases of acute alcoholism (11/73) ($p=0.003$). Chronic alcoholism in personal pathological antecedents of the patients determined a relative risk of intoxication 2,59 times higher ($RR=2,59$; $IC95\%$: 1.39-4,84) (Fig. 3)

Figure no. 3. Distribution of OPS patients depending on the alcohol level registered upon admission and on personal pathological antecedents



By comparing the number of patients on different types of alcoholism, chronic or acute, depending on the epidemiological characteristics, we can see that the number of cases of male sex with chronic alcoholism in antecedents (38/66) is significantly higher than in the case of females (26/71), ($p=0,022$), in case of males the relative risk is 1,57 times higher ($RR=1,57$; $IC 95\%$; 1,09-2,28)

Figure no. 4. The distribution of the OPS patients on types of alcoholism depending on the alcohol level registered upon admission and on sex



Depending on the environment of origin, we can see that the number of patients with chronic alcoholism in antecedents coming from the urban environment (26/56) is lower than the value registered in the rural environment (38/81), but nonsignificant difference ($p=0.906$).

In the case of alcohol coingestion, the hospitalization period varied from 2 to 26 days for patients with chronic alcoholism and from 2 to 18 days for patients with acute alcoholism.

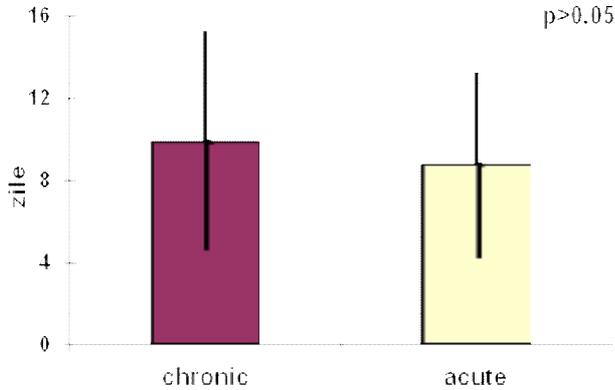
Depending on the presence of chronic alcoholism in personal pathological antecedents of the OPS patients, the average values of the hospitalization periods do not differ significantly from a statistical point of view ($t=1,87$; $GL=135$; $p>0.05$).

With the OPS patients, the distribution of patients with alcohol ingestion upon admission over the normal limits, whose evolution was not favorable, showed significant differences

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($p=0.037$); 6 of the 7 fatalities were registered in the case of patients with alcohol coingestion.

Figure no. 5. Average values of the hospitalization period for OPS patients on types of alcoholism



The relative risk of fatality in the case of alcohol coingestion for patients with intoxications with organophosphoric substances is 6,65 times higher (RR=6,65; IC 95%; 0,82÷53,75).

CONCLUSIONS

The number of male patients (38/66) with values over the admitted limit was significantly higher than the number of female patients (26/71) ($p=0.048$); the relative risk of OPS intoxication was 1.57 times higher for male patients with alcohol coingestion.

The number of cases of chronic alcoholism, with values of the alcohol level over the normal limit upon admission (25/64) was significantly higher as compared to the cases of acute alcoholism (16/73) ($p=0.003$). Chronic alcoholism in personal pathological antecedents of the patients determined a relative risk of intoxication 2,59 times higher.

In the case of patients with alcohol coingestion, a very weak direct correlation was registered between the alcohol concentration in the blood and the level of cholinesterase ($r=0.09$), but it is to be noticed that high levels of alcohol level were associated with low levels of cholinesterase.

The distribution of patients with alcohol ingestion over the normal limits upon admission, whose evolution was not favorable, showed significant differences ($p=0.037$); 6 out of 7 fatalities were registered in the case of patients with alcohol coingestion. The relative risk of fatality in the case of alcohol coingestion for patients intoxicated with organophosphoric substances is 6,65 times higher.

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