The Impact of Alcohol Consumption on Mortality Among Patients with Complex Cervical Trauma

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Alcohol seems to be an important risk factor and a major cause of death for the patients with complex cervical trauma. The morbidity and mortality by complex cervical trauma is increasing all over the world, the most common mechanism of damage being a stab wound from violent attack, but also gunshot wounds, road traffic accidents or self-harm are noted. In addition to penetrating trauma, neck injuries can appear due to blunt trauma. We conducted a retrospective analysis on 289 deceased patients by complex cervical trauma. We aimed to focus on the relationship between alcohol blood level and cervical trauma mortality by various mechanisms. In our study, the alcohol blood level in deceased patients by complex cervical trauma is influenced by gender and socioeconomic background. Alcoholism was correlated with autolithic mechanism in 56.3% of the cases and aggression in 46.7%. Complex cervical trauma represents a pathology with multifaceted epidemiological, etiopathogenic and pathophysiological processes. Our results could bring new epidemiological data in order to improve public health policies, and from there to decrease alcohol related mortality on cervical trauma.

Keywords: alcohol; blood; complex cervical trauma; alcohol related trauma

Complex cervical trauma is a common cause of morbidity and mortality worldwide [1,2] and a real problem of public health, in the context of increased rate of aggression, suicide attempts and road accidents [2]. Neck injuries are mainly due to blunt trauma provoked by strangulation or hanging [3] or penetrating causes as result of knife injury or gunshot assault. The blunt trauma mortality is considered to be higher compared to penetrating trauma [4]. A significant risk factor with great impact on complex cervical trauma mortality is alcohol, considered a major cause of death among these subjects [5,6].

Alcohol represents one of the most important risk factors for serious and fatal injuries [5-8], being the most frequent toxic with health and social effects [7]. Epidemiological data show statistically significant associations between alcohol consumption and the socio-economic level [10]. Clinically, it is manifested by acute or chronic poisoning [9]. This compound is a harmful agent that affects a wide range of structures and processes in central nervous system. By their mutual action on personality, and behavior, they are a contributing factor in intentional or unintentional injuries that occur both to consumers, as well as to those around. These injuries include violence among people, suicide, homicide, and alcohol-related accidents. The frequency of drinking and the quantity of alcohol consumption increases the risk of trauma, the risk of suicide and leads to an exacerbation of psychiatric pathologies [11,12].

The aim of this study was to assess the interrelationship between blood alcohol levels and complex cervical trauma on deceased patients, and to highlight some correlations between production mechanisms and other demographic factors.

Experimental part

We realized a retrospective study on 289 patients from all Moldavian counties, who died by complex cervical trauma, produced by various mechanisms such as car accidents, domestic accidents, aggression, ballistic trauma, autolytic attempts, hanging or strangulation. We conducted our study during 2012-2014. The postmortem examination was performed in the Institute of Forensic Medicine, Iasi. We aimed to establish the etiopathogenic, morphopathological and forensic aspects related to this type of pathology and to highlight the influence of alcohol blood level on it. All the information was selected from the observation sheets: demographic data, epidemiological features, lesion appearance and mechanism, postmortem blood concentration of alcohol. Patients with incomplete data were excluded from the study. The identity of the patient was kept confidential.

Determination of alcohol in the blood was performed by Gas chromatography which exclusively determines ethyl alcohol [20-21]. The method uses a gas chromatograph with a head-space device, a flame ionization detector, which has nitrogen as carrier gas and hydrogen and air flow as combustion gas. Gas chromatography allows the separation of volatile compounds from total blood flowing through a capillary column and separated by molecular weight and boiling points [22-23]. The blood sample together with the internal standard (in equal quantities) is preheated in head-space for 10 min at 80°C; ethanol molecules are therefore recognized by the flame ionization detector immediately after their passage through the separation column [24]. They produce an electrical signal (*peak*) proportional to the amount of compound in the blood [25].

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The data were uploaded and processed using statistical features in SPSS 18.0. The results were given as arithmetic mean with SD. We used the F (ANOVA) test for group comparisons, baseline associations between continuous variables were analyzed using the χ square test and the Pearson correlation coefficient (r).

This research was analyzed and approved by the Ethics Committee of the University of Medicine and Pharmacy Grigore T. Popa, Iasi, in agreement with the ethical principles of the Helsinki Declaration [13-19].

Results and discussions

The blood samples results revealed an alcohol level ranging from 0 - 3.85 g‰, the average values being 0.93 ± 1.02 g‰ and the median 0.60 g‰; yet, Skewness test (p = 0.697) and Kurtosis test (p = -0.773) interpretation suggest the normality of the series of values (table 1, fig.1).

Table 1

STATISTICAL DATA ON BLOOD ALCOHOL LEVEL

N	Valid	278
Average		0,93
Median		0,60
Dev.Std.		1,02
Variant		1,05
Skewness		0,697
Std. Error of Skewness		0,146
Kurtosis		-0,773
Std. Error of Kurtosis		0,291
Minimum		0
Maximum		3,85
Percentiles	25	0
	50	0,60
	75	1,75

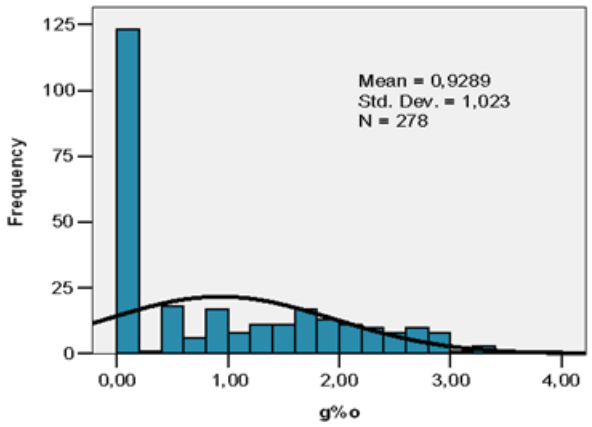

Fig.1. Histogram of blood alcohol level values

The alcohol has initially a cerebral excitatory effect, but at high doses produces behavioral and disposition changes such as depression, anxiety and even paralysis of the nervous system, until abolishing vital functions [6, 26]. The lethal dose is 4-6 g pure ethanol / body weight, but there are large individual variations [9]. Clinically, an alcohol level less than 0.4g ‰ (grams of pure alcohol per 1000 mL blood) does not display clinical manifestations or induces mild talkativeness and slows the reflex responses. The first phase of acute intoxication or the light drunk phase, occurs at alcohol concentration of 0.4-1g ‰, and manifests as a state of euphoria, disinhibition with expansiveness, impulsivity, decrease of self-control, weakening of attention. The second phase or drunkenness or forensic phase, take place at blood alcohol level between 1-3g ‰, with symptoms of psycho-sensory disturbance, alteration of intellectual capacities: judgment, attention, memory, mental disorders (disorientation, confusion), disappearance of self-control, aggressive changes, sensory disorders. Over 3g ‰ comatose phase occur, with symptoms of deep central nervous system depression, coma, reflex abolition, anesthesia, hypotonia, sphincter relaxation, mydriasis, hypothermia, slowing of vital functions (severe decrease of blood pressure). All these symptoms are followed by coma with areflexia and death by respiratory collapse due to paralysis of bulbar respiratory centers. The ethanolic chronic poisoning involves an excessive consumption associated with alcohol addiction [9].

In our research, the presence of alcohol in the blood was identified in 55.4% of the 278 patients: 90.9% were males, 18 - 80 aged, 51.3% aged less than 45 years and 77.9% with rural origin (fig.2).

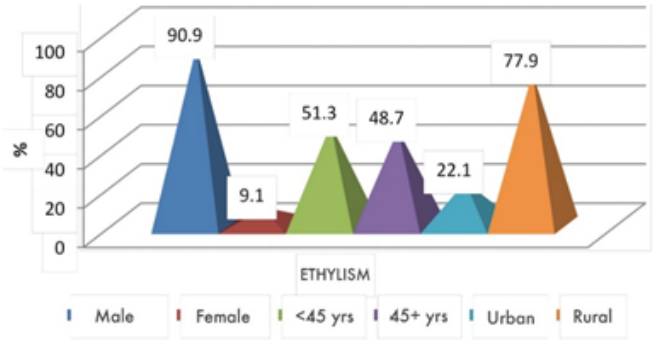

Fig.2. Epidemiological features of patients with alcoholism

It can be seen that the alcohol blood level in deceased patients by complex cervical trauma is influenced by gender and socioeconomic background. Demographic and socioeconomic factors underlie the prevalence of alcohol-related trauma. These findings may guide targeted interventions toward specific populations in order to reduce the burden of alcohol-related injury [27].

In our cases, it was found that the alcohol level was significantly higher in patients with autolysis (0.94 ± 0.92 g‰), while in patients with accidental mechanism the presence of alcohol was not detected. It should be noted that the attacked patients showed a quite high level of alcohol (0.84 ± 0.87 g‰) (p = 0.048) (table 2). Epidemiological studies show that patients with positive blood alcohol concentration have a higher rate of face injury and lower head and neck injury [28].

Alcoholism was correlated with autolithic mechanism in 56.3% of the cases and aggression in 46.7% (p = 0.151) (fig. 3). Alcohol and substance abuse in general are risk factors for suicide, but very little is known about the immediate effect in relation to suicide method. Based on information from 18,894 medico-legal death investigations, including toxicological findings and manner of death, Lundholm et al. investigated the immediate influence of alcohol and the use of a violent suicide manner [29].

The researches over the last few years have shown that alcohol use is related with increased frequency of traumatic injuries [30] with a high risks occurring among individuals involved in violence and sports [31] in addition to car accidents. Also, same data revealed that alcohol consumption may also lead to poorer outcomes among individuals who suffer trauma [32]. Studies related to the sociological impact of alcohol consumption reveal that 50% of trauma-related mortality cases occur in pre-hospital

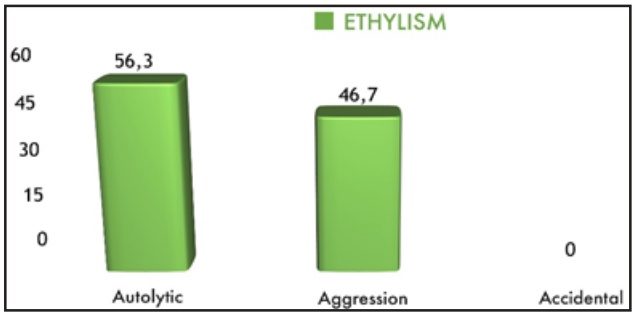

Fig 3. Distribution of cases according to the lesion mechanism

Mechanism	N	Avarage	Standard Deviation	Standard Error	Confidence Interval 95%		Min	Max	Test F (ANOVA) p
					-95%CI	+95%CI			
Autolytic	261	0.94	0.92	0.06	0.82	1.07	0	3.85	
Aggression	15	0.84	0.87	0.28	0.25	1.43	0	2.90	**0.048**
Accidental	2	0.00	0.00	0.00	0.00	0.00	0	0.00	
Total	278	0.93	0.72	0.06	0.81	1.05	0	3.85	

Table 2
DESCRIPTIVE INDICATORS OF ALCOHOLISM ACCORDING TO THE LESION MECHANISM

settings, due to the effect of alcohol increasing the risk of severe lesions and on the resuscitation protocol [33]. Different laboratory studies supported the idea that alcohol has potentiating and negative consequences increasing predisposition for higher trauma severity, even in small doses. Experimental studies on laboratory animals have shown a link between the severity of neurological damage, survival rates and alcohol [34]. Other studies have noticed that alcohol consumption has implications at cellular and tissue levels, through action on the integrity of the cell membrane [35].

But even alcohol is considered a major risk factor for injury, 30% to 50% of all patients hospitalized with trauma being intoxicated at the time of the damage [30] the consequence of alcohol on injuries outcomes is still debatable. For example, several animal studies have reported harmful effects of alcohol on traumatic brain injuries outcomes [36, 37]. Other studies, though, have reported a neuroprotective function of alcohol or no influence on trauma brain damage [38,39].

Conclusions

We realized a retrospective study in which we analyzed the impact of alcohol consumption on mortality among patients with complex cervical trauma. Our results have shown that a high blood alcohol concentration which was associated with higher mortality in complex cervical trauma produced by an autolithic mechanism, in a male patient with an average age of 45 years and of rural origin. As this study suggest, there are significant implications of this risk factor over the trauma mechanism and demographic data. These findings, perhaps may lead to changes in our public health policies, and from there to decrease alcohol related mortality on cervical trauma.

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