

Estimation of Early Postmortem Interval Through Biochemical and Pathological Changes in Rat Heart and Kidney

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Abstract: Accurate estimation of time passed since death is a complicated task in forensic medicine especially in homicide or unwitnessed death investigations. Changes in oxidant/antioxidant parameters were investigated if it can be relied upon in estimating the early postmortem interval (EPI) in rat heart and kidney, and whether these changes were correlated with histopathological findings in these tissues. Heart and kidney tissues of 84 male albino rats were divided into 2 parts. One part used for estimation of levels of malondialdehyde (MDA), nitric oxide (NO), and total thiol as well as the activity of glutathione reductase (GR), glutathione S transferase, and catalase. The second part was examined histopathologically. It was found that MDA and NO were significantly increased earlier in the heart than kidney tissues. Meanwhile, total thiol, catalase, glutathione S transferase, and GR were commenced to be significantly decreased in the heart before kidney tissues. Linear regression analysis of independent variables of heart was found to be of a high predictive value of 97.2% ($EPI = 8.607 - 0.240 GR + 0.002 MDA + 0.014 NO$). Structural deterioration of heart started 3 to 4 hours compared with renal sections that began 5 to 6 hours after death. The relationship between oxidant and antioxidant parameters is crucial in determining the EPI. The kidney was found to be more resistible to oxidative damage. Further research on humans is needed.

Key Words: early postmortem interval, oxidants, antioxidants, heart, kidney, histopathology, rat

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SERUM ACUTE PHASE PROTEINS AS NOVEL MARKERS OF MYOCARDIAL INJURY IN ACUTE CARBON MONOXIDE POISONED PATIENTS

BY

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ABSTRACT

Acute carbon monoxide (CO) poisoning is considered one of the most common types of poisoning. CO stimulates inflammatory processes that may activate acute phase response. Additionally, myocardial injury is considered a serious complication of this type of poisoning. Hence, the aim of this study was to assess some acute phase proteins in acute CO poisoned patients and their possible role as novel markers of carbon monoxide induced myocardial injury. Fifty patients with acute carbon monoxide poisoning admitted to Poison Control Unit, Tanta University from the first of May 2013 to the end of April 2015 were studied. Each patient was subjected to full history taking, clinical examination and the following investigations; arterial blood gases, serum troponin I (TnI), acute phase proteins (high sensitive serum C- reactive protein (hs-CRP), total leucocytic count (TLC), serum albumin) and carboxyhemoglobin (COHb) concentration were measured. Apparently healthy fifty individuals matched for age and sex of the studied cases represented the control group. The mean age of the studied group was $34.7 \pm 10.3y$ with nearly equal sex distribution (24 female: 26 male). Palpitation was the most common symptom (84%), hypotension and tachycardia were recorded in 76% and 70% respectively. ECG was normal in 30%, sinus tachycardia was observed in 60%, while ischemic changes were detected in 24% of the studied patients. In addition, serum CRP and TLC were higher while serum albumin was lower in the studied patients than in control subjects. Moreover, acute phase proteins were affected more significantly and correlated well with myocardial injury. So, the determination of CRP level, TLC or serum albumin on admission could be readily available and effective tools in evaluating acute CO poisoning and detecting the presence of myocardial injury.

Keywords: Carbon monoxide poisoning, serum acute phase proteins, myocardial injury, troponin I.

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Chlorpyrifos-Induced Acute Neurotoxicity in Hippocampal Formation of Adult Male Albino Rats

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Abstract:

Chlorpyrifos (CPF) is a widely used organophosphorus (OP) pesticide. Despite the availability of antidotal therapies (atropine and oximes) for treatment of acute OP poisoning, morbidity and mortality rates are still high. The aim of this work was to study the effect of intravenous lipid emulsion (ILE) in CPF-induced acute neurotoxicity in rats and to find the best time point for its administration. Eighty adult male albino rats were randomly assigned into seven groups as follows: group I (control negative), group II (control positive), group III (ILE), group IV (CPF), group V (CPF & ILE 45 min.), group VI (CPF & ILE 2 h, 45 min.) and group VII (CPF & ILE 4 h). After 24 hours, animals were sacrificed and brain was extracted and processed for histological examination of hippocampal formation by haematoxylin and eosin stain, glial fibrillary acid protein (GFAP) and nuclear factor kappa (and NF- κ B) immunostaining. In group IV, degenerative and necrotic changes were evident in all regions of hippocampus. Group V showed partial protection, group VI had no toxic effects while group VII demonstrated toxic histopathological changes similar to group IV. In conclusion, ILE administration at 2 hours and 45 minutes post CPF exposure in adult male albino rats showed the best protective effect against CPF-induced acute neurotoxicity on hippocampus.

Keywords

Chlorpyrifos; Lipid emulsion, Hippocampus; dentate gyrus

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EVALUATION OF POSTMORTEM SERUM INSULIN-LIKE GROWTH FACTOR 1 LEVELS IN TRAUMATIC DEATHS WITH REGARD TO THE SURVIVAL TIME AND SEVERITY OF TRAUMA

BY

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ABSTRACT

Several clinical studies showed reduced levels of circulating insulin-like growth factor 1 (IGF-1) in patients with acute trauma. The aim of this study was to investigate postmortem serum IGF-1 levels in traumatic deaths with special regard to the survival time and severity of trauma. This study was carried out on eighty cases of mechanical traumatic deaths subjected to medicolegal autopsy in El-Mansura Department of Forensic Institute during the period from the start of January 2014 to the end of October 2015. Only adult males aged 18 years or more were included. Decomposed bodies and/or those with no confirmed survival period were excluded. For each case, the age, cause and site of trauma, survival period and the cause of death were reported. Additionally, Rt cardiac blood samples were taken using sterile syringes for determination of IGF-1 levels. According to the affected body region, cases were grouped in to: group 1 (isolated head trauma, n=20), group 2 (body trauma without head trauma, n=30), and group 3 (combined head and other regional body trauma, n=30). A control group of ten male cases with nontraumatic natural deaths matched for age were selected. There was significant decrease in IGF-1 levels in all the studied groups of traumatic deaths compared to the control group. Additionally, mean IGF-1 levels in group 3 were significantly lower compared to groups 1 and 2. In all the studied groups, there was significant negative correlation between serum IGF-1 levels and the survival time (hs) and prediction of survival time (hs) was determined by simple linear regression analysis. A significant negative correlation was also detected between IGF-1 levels and the total abbreviated injury scale (AIS). In conclusion, this study demonstrated for the first time low postmortem serum IGF-1 levels in males died from mechanical trauma with significant negative correlation with the survival time and trauma severity.

Keywords: Serum insulin-like growth factor 1, mechanical traumatic deaths, survival time, medicolegal autopsy, abbreviated injury scale.

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Role of Inducible Nitric Oxide Synthase and Interleukin-6 Proteins Expression in Estimation of Skin Burn Age and Vitality: Immunohistochemical Study in Rat

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Abstract:

Estimation of age and vitality of burn injury both in the living and dead is essential in forensic practice. Nitric oxide and interleukin-6 (IL-6) play an important role in skin burn healing. In this immunohistochemical study, the expression of inducible nitric oxide synthase (iNOS) and IL-6 proteins during skin burn injury healing in rats was studied for purposes of burn dating and to differentiate between ante-mortem and post-mortem burn. Ante-mortem full-thickness skin burns were created on forty five rats with a heated soldering iron applied for three seconds. Normal and burnt skin samples were taken at 1, 3, 5, 7, 9, 11, 13, 15 and 21 days following burn induction (5 rats for each stage). Post-mortem burn was inflicted 6h. after scarification in another five rats. There was a statistically significant difference in both iNOS and IL-6 expression between the different studied time intervals of the ante-mortem burn. Expression of both iNOS and IL-6 decreased remarkably in the post-mortem burn with a statistically significant difference from all the studied ante-mortem intervals. A statistically significant positive association between the two markers was found; both increased gradually in the inflammatory and early proliferation stages and started to decrease in late proliferative and remodeling stages while reaching the minimum in the post-mortem burn. These results indicate that both iNOS and IL-6 expression in ante-mortem burnt skin was time dependent and significantly differed from post-mortem burn. Further research on humans is recommended.

Keywords; Skin burn aging; skin burn vitality; inducible nitric oxide synthase; interleukin-6; immunohistochemistry; rat.

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Red Blood Cell Distribution Width And C-Reactive Protein As Biomarkers Predictors Of Mortality In Acute Aluminium Phosphide Poisoning Cases

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Background: Aluminium phosphide (ALP) is one of the most common causes of poisoning among agricultural pesticides due to its immediate effect of releasing lethal phosphine gas. Phosphine is known to be a respiratory inhibitor. It also induces oxidative stress. Red cell distribution width (RDW) and C- reactive protein (CRP) have been investigated as predictive biomarkers of mortality in some acute poisoning cases.

Objective: The aim of this study was to evaluate RDW and CRP as predictors for mortality in some cases of acute aluminium phosphide poisoning cases.

Subjects and methods: This study was carried out on 60 patients with acute aluminium phosphide poisoning admitted to Toxicology Unit of Tanta University Emergency Hospital in the period from the first of January 2013 to the end of July 2015. On admission, each patient was subjected to full history taking, complete clinical examination and routine laboratory investigations. Outcome of the poisoned patients was studied as regards duration of hospital stay, need for mechanical ventilation and mortality .

Results: The study participants showed nearly equal sex distribution. Patients in the age group of 18- 40years represented the highest percentage (51.7%). Abdominal colic, diarrhea and dyspnea were the most significant symptoms. The mortality rate noticed in this study was 30% (18 out of 60). No significant difference among different age groups between survivors and non- survivors. Patients who didn't survive were mostly female with a ratio of 5:1 to males. All of them took the poison by ingestion for suicidal intent. All patients who didn't survive suffered from tachycardia and hypotension. They had a significant lower Glasgow coma scale (GCS) than those who survived. All laboratory data (with the exception of Na⁺ and K⁺) were significantly affected in non-survivors compared to survivors. None of the survivors needed mechanical ventilation while 13 out of 18 dead patients needed mechanical ventilation. RDW and CRP were positive predictors for mortality as identified from the ROC curve analysis.

Conclusions: It is concluded that RDW and CRP are good predictors of mortality in patients with acute ALP poisoning. The low cost and easy attainability of these parameters may strengthen their usefulness in daily practice in the near future. However, the study was small sample and one poison centre study. This calls for further studies for more patients from multipoisoning centers.

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Electric injury-induced Purkinje cell apoptosis in rat cerebellum: Histological and immunohistochemical study

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Introduction: Electrical injury is a prominent problem in low income countries with increased morbidity and mortality rate. Nervous system is one of the most susceptible systems to electrical current because of its low resistance. There were different studies demonstrated electrocution effect on the nervous system, however little was made on the cerebellum. **Aim:** This study was conducted to produce an experimental suggestion concerning injury of the nervous system through evaluating Purkinje cell apoptosis and number in rat cerebellum by fatal and non-fatal electric current using histological and immunohistochemical study. Also to support the diagnosis of electrocution as a probable cause of death and delayed neurological damage as well as disability. **Materials & methods:** Fifty male Wistar rats were divided into five groups (10 rats each); control group: normal rats that were sacrificed without exposure to electric current, groups 1–3 (non-fatal electrocution groups): rats were exposed to alternating electric current (220 v, 50 Hz) for one minute then were sacrificed immediately, after 2 h, and after 4 h respectively, and group 4 (fatal electrocution group): rats were sacrificed after being electrified up to death (153 ± 27 s). Sections from cerebellum were processed for histological and caspase-3 immunohistochemical study. **Results:** Purkinje cells showed marked histopathological changes in the form of shrunken dark stained cells with significant reduction of their number in H & E stained sections when compared to control, widespread argyrophilia, and degenerated organelles along with shrunken irregular nuclei. For caspase-3 staining, there was significantly increased number of caspase-3 positive cells in groups 1–3 (non-fatal electrocution groups) and markedly increased in group 4 (fatal electrocution group) in comparison to control group. These changes were gradually increased with the increased duration after exposure to the electric current. **Conclusion:** Apoptosis and loss of Purkinje cells were involved in the pathogenesis of immediate and long term effect of electrical injury on Purkinje cells, which will be an aid to the forensic pathologist to determine the cause of death and residual damage as well as disability after electric shock.

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Forensic and clinical significance of serum amylase, lipase and gamma glutamyl transferase as predictors of outcome in head injured patients

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Head trauma is one of the leading causes of death and disability worldwide. Combined head lesions consist of more than one form of lesions. Biochemical markers of brain injury are used in determining the extent of brain injury and predicting its outcomes. The aim of this study was to investigate the forensic and clinical significance of serum amylase, lipase and gamma glutamyl transferase (GGT) as predictors of the outcome in head injured patients. Patients and methods: Sixty head injured patients were enrolled and subjected to personal history taking, general and local physical examination. Glasgow coma scale (GCS), head computed tomography scan and pelvi-abdominal ultrasound were performed. Two blood samples (each 3 mL) were drawn at the time of admission and after 24 h for measuring serum amylase, lipase and GGT levels using special kits.

Results: Most cases of head trauma occurred accidentally during daytime, in the street as a result of falls and road traffic accidents (RTA). Significant increase of serum amylase, lipase and GGT levels on re-evaluation after 24 h from admission were demonstrated in combined head lesions. There was a high significant negative correlation between GCS and these enzymes both on admission and 24 h after admission. Serum levels of measured enzymes were significantly higher in non-survivors as compared to survivors.

Conclusion: Serum amylase, lipase and GGT are good predictors of the outcome in head injured patients. This could be useful for forensic experts to deduce that the poor outcome of the victims was primarily related to the effects of head trauma and its sequences.

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