THE 30TH INTERNATIONAL MEETING ON FORENSIC MEDICINE ALPE – ADRIA – PANNONIA

ABSTRACT BOOK

Šibenik, Croatia
May 21 – 24, 2025

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TABLE OF CONTENTS

SCIENTIFIC SESSION ABSTRACTS

A STRUCTURED QUESTIONNAIRE SHOULD BE INCLUDED IN THE COLLECTION OF DATA ON SUDDEN CARDIAC DEATH

Armin Alibegović[1], Marija Baković[2]

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Sudden cardiac death (SCD) is defined as unexpected death within the first hour of the onset of symptoms and signs leading to death due to previously unknown heart disease in an apparently healthy person. The incidence of SCD in the population aged 20-75 years is 18.5% of all deaths. In the age group 1-40 years, the incidence is 1.3-8.5 per 100,000 people per year. Hypertrophic cardiomyopathy is the most common morphological cause of SCD in young people. Primary arrhythmogenic disorders rarely cause structural changes in the heart, so it is essential to perform a comprehensive forensic autopsy, which is internationally harmonized with several protocols, and includes genetic testing. The latest guidelines for the treatment of SCD stipulate that genetic testing should be mandatory for all deceased persons from the age group 1-40 years, in the age group 40-65 years in case of suspected SCD, and in the age group 65 years and older, decisions would be made on a case-by-case basis. If SCD is considered at any stage of determining the cause of death, especially in the case of genetic testing, additional data collection is required, which is most easily and completely done with a structured questionnaire.

Keywords: sudden cardiac death; forensic autopsy; arrhythmogenic disorders; genetic testing; questionnaire.

CARDIAC HYDATID CYST MORTALITY: CASE REPORTS AND A COMPREHENSIVE REVIEW

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Cardiac echinococcosis is a rare but significant cause of mortality and morbidity, particularly in regions endemic to the Echinococcus parasite. Its high mortality rate, reported to be 15-20%, is mainly attributed to its associated severe complications. However, mostly the condition is asymptomatic until complicated or presented with sudden death.

This article reports three different cases and studies fatal cardiac hydatid cysts in 38 articles which were eligible according to the inclusion criteria and involving 46 cases; their demographic distribution, the features of the cysts, other organ involvement, their presentation, and the cause of death. Males under 40 years were the mostly affected by this disease, predominantly in regions such as Turkey, Tunisia, and Iran. Although the cysts were found in all cardiac parts, the left ventricle was the most commonly affected. Isolated cardiac cysts were found in over half of the cases, while the remainder had additional cysts in other organs, mainly in the liver, kidneys, and lung. At the end, hydatid cysts of the heart were found to cause death by arrhythmias, heart failure, anaphylactic shock, pulmonary hydatid embolism, or cerebral hydatid embolism.

This article highlights the importance of early detection of hydatid cyst of the heart, as many cases are diagnosed postmortem after sudden collapse and death. Early detection is crucial, and cardiac echinococcosis should be considered in the differential diagnosis of cysts that were found at any body part, especially in endemic areas. Furthermore, this review emphasizes the need for continued research to understand the mechanism of fatality, hoping that the current high mortality rate would be reduced significantly.

Keywords: autopsy; heart; echinococcosis; cardiac cyst; embolization.

UNDERSTANDING SUDDEN CARDIAC DEATH THROUGH AUTOPSY: A FORENSIC PERSPECTIVE

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Sudden cardiac death (SCD) remains a major cause of mortality, often occurring without warning signs. Despite significant advances in cardiology, sudden death frequently represents the first manifestation of undiagnosed cardiac disease.

In this retrospective autopsy-based study, we analyzed all cases of sudden death autopsied at the Institute of Forensic Medicine, University of Belgrade, during 2022. From the total of 1210 autopsies performed, 365 cases (30.2%) were identified as sudden cardiac death (SCD).

A significant male predominance was observed (66% male, 34% female), with the majority of cases occurring in the 40–69-year age group. Ischemic heart disease was the leading cause of death (72.3%), pulmonary thromboembolism (8.8%), and rupture of an aneurysmally dilated aortic wall (4.7%). Morphological examination revealed that the mean heart mass was 465.81 grams, with an average left ventricular wall thickness of 1.7 cm, interventricular septum thickness of 1.2 cm, and right ventricular wall thickness of 0.5 cm. Signs of left ventricular hypertrophy were present in 70% of cases, correlating strongly with undiagnosed or poorly controlled arterial hypertension, confirmed in over 60% of the examined individuals. Myocardial fibrosis, as a substrate for fatal arrhythmias, was a frequent histopathological finding (97.3%), ranging from mild to moderate interstitial fibrosis to severe fibrotic remodeling, including the presence of myocardial aneurysms.

Although rare, SCD in individuals under 40 years of age accounted for 4.9% of all cases, again with a striking male predominance (83.3%). In this younger cohort, the most common causes were cardiomyopathies and myocarditis, whereas in a small subset, no morphological abnormalities were detected, highlighting the potential role of molecular autopsy in identifying concealed hereditary conditions.

Our study confirms that forensic autopsy remains irreplaceable for accurately determining the cause of sudden cardiac death. A comprehensive postmortem examination reveals hidden cardiovascular diseases and provides critical epidemiological insights for public health interventions. The future integration of classical autopsy methods with molecular investigations represents a promising approach for elucidating unexplained deaths and guiding preventive strategies for surviving relatives, ultimately aiming to reduce the burden of sudden cardiac death in the general population.

Keywords: sudden cardiac death; autopsy; ischemic heart disease; cardiomyopathy; myocardial fibrosis.

SUDDEN CARDIAC DEATH IN ATHLETES: FORENSIC CHALLENGES IN ATHLETIC SUDDEN CARDIAC DEATH

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Sudden cardiac death (SCD) in athletes is a rare but alarming event that often affects young, seemingly healthy individuals during or shortly after physical exertion. Although the overall incidence is low (1–3 per 100,000 athletes annually), competitive sports are associated with a 2.5-fold increase in risk compared to the general population. Most cases are linked to previously undiagnosed cardiovascular conditions such as hypertrophic cardiomyopathy, coronary anomalies, or myocarditis.

Case 1: a professional football player died suddenly during training. Autopsy revealed chronic myocarditis with diffuse interstitial fibrosis, despite no reported prior symptoms. Toxicology was negative, and other natural and violent causes of death were excluded. Notably, the athlete had previously recovered from infectious mononucleosis but had resumed full activity without complaints. This case underscores the potential for severe, asymptomatic cardiac pathology to remain undetected in elite athletes despite routine screenings.

Case 2: a 20-year-old basketball player with a prior diagnosis of hypertrophic cardiomyopathy was advised in 2006 to refrain from sports due to his condition. Despite medical restrictions, he continued to train five times per week, reportedly without symptoms. On January 13, 2009, he experienced sudden collapse before a training session and died shortly after. Autopsy revealed a markedly enlarged heart (750 g; 13×13 cm) with concentric left ventricular hypertrophy, including interventricular septal thickness up to 25 mm. Extensive myocardial fibrosis, particularly in the septum and mid-myocardial layers, was observed. Despite a pre-participation screening declaring him fit for sport in May 2008, he died just eight months later. This case emphasizes the dangers of noncompliance with medical advice and the need for stricter enforcement and education regarding participation restrictions in athletes with known high-risk cardiac

Conclusion: SCD in athletes is primarily due to undiagnosed cardiac pathology. Both cases reflect the diagnostic challenge of detecting silent but fatal cardiac conditions, especially in athletes with high physiological demands. Forensic case analysis also emphasizes the role of forensic investigation—including autopsy, histopathology, toxicology, and molecular testing—in confirming the cause and mechanism of death, and in guiding preventive measures.

Keywords: sudden cardiac death; athletes; forensic pathology; sports medicine; screening.

SIGNIFICANCE OF CHONDROCYTE VIABILITY IN POSTMORTEM INTERVAL ASSESSMENTS AND CHONDROCYTE VIABILITY ASSAY

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Determination of the postmortem interval (PMI) is one of the most challenging problems in forensic medicine. The main aim of this study was to determine the dynamics of the decrease in the fraction of viable chondrocytes excluded from the donors' knees for PMI determination. The other aim was to find an appropriate method for chondrocyte viability assay. We analyzed osteochondral cylinders from 35 donors (28 males and 7 females), aged 44 to 90 years, whose bodies were stored in refrigerators at temperature of 8±2°C, during the period from 4 to 83 days postmortem. The proportion of viable chondrocytes was determined by flow cytometry (FC) and cell viability analyzer (CVA). For FC we used RedDot™1 to mark all chondrocytes with nuclei (method FCN) and 7-AAD, to distinguish live/dead cells (method FCC) among RedDot™1 positive cells. Results revealed that chondrocytes from the knee cartilage can be found alive after more than two months postmortem. We observed that even in controlled temperatures and environment, the predicted interval for PMI is too wide for this method to be used in daily forensic practice, likely due to the relatively small number of donors considered in our study, and other unknown factors that affect the viability of chondrocytes in dead bodies. This could be verified with a larger number of donors followed over a longer period. FCC is a slightly superior method over CVA and FCN in terms of its ability for PMI determination.

Keywords: knee cartilage; chondrocyte; time since death; flow cytometry; cell viability analyzer.

REVIEW OF FORENSIC RADIOLOGY AT DEPARTMENT OF DIAGNOSTIC AND INTERVENTIONAL RADIOLOGY

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Forensic radiology is a field of medical imaging that applies various radiological techniques to assist in legal investigations, primarily focusing on the examination of injuries and the identification of deceased individuals. The integration of these technologies has revolutionized the field, enabling forensic experts to accurately analyze skeletal trauma, internal injuries, and foreign objects within the body.
In this article, I present a selection of forensic radiology cases performed at our Department, illustrating the value of postmortem imaging in a variety of medico-legal contexts. After an introduction to paleoradiology, presenting selected examples of radiological analysis in archaeological and historical human remains.
Among the forensic cases will be the first postmortem CT (PMCT) examination ever conducted in Croatia, as well as a striking example of drug smuggling involving internal concealment of cocaine "packs" within the intestines. Additionally, I will present imaging findings from the examination of skeletal remains of children discovered buried in a residential garden. These cases highlight the critical role of radiological techniques in modern forensic investigations, particularly in non-invasive analysis of trauma, identification of foreign bodies, and documentation of complex forensic findings.

LOST AND FOUND: MEDICO-LEGAL INFORMATION LEFT BEHIND IN EMERGENCY DEPARTMENT IMAGING REPORTS

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Medico-legal investigations often require the evaluation of clinical documentation including imaging reports of radiological exams originally performed for clinical purposes. Evidence reported in clinical documentation such as anamnesis and objectivity rely on the clinical doctor ability and experience which may be hampered in the emergency setting where physicians may tend not to go into detail of medico-legal findings which are not clinically relevant. Consequently, a limiting factor in ex-post medico-legal evaluation is represented by the report accuracy and completeness of the report. While in a clinical report collateral information of medico-legal interest are irreversibly lost, imaging allows to reevaluate scans and recreate the full story including all the potentially relevant forensic information such as soft tissues involvement. Lesions in the soft tissues can be of valuable forensic interest offering reproducible information about lesions' nature (blunt or sharp force), means compatibility, event dynamic (number and precise anatomical localisation of lesions) etc. Furthermore, in case of CT scans the lesions of major interest can be deeper investigated and better displayed in court using 3D reconstruction software and 3D printer. To confirm the hypothesis that medico-legal information can be lost during radiological evaluation of imaging indicated for clinical purposes we retrospectively evaluated CT scans performed in the Emergency Department at Policlinico Universitario 'D. Casula' – AOU Cagliari. A total of n=123 head CT scans performed in December 2024 were included in the analysis. Data extraction guaranteed the full anonymization of the patients. Another dataset of n=29 head CT scans was used to specifically investigate imaging in which the clinical indication included potential forensic interest ('aggression and/or victim and/or beating'). The following parameters were assessed in both imaging report and ex novo CT scans evaluation performed by a senior radiologist: intra/extra-axial lesions, midline shift, bone fractures, and soft tissue lesions. The latter were furtherly evaluated according to anatomical localisation (left/right/median, anterior/posterior). Other parameters recorded were demographical factors and reports timing. Results were investigated through univariate statistical analysis. The analysis demonstrated a complete agreement between original report and re-evaluation with respect to major clinical lesions detection such as intracranial bleeding, midline shift and fractures. On the other hand, a significant discrepancy in soft tissue lesion reporting was observed between the two observations particularly prominent during night shifts. Results demonstrated that re-evaluation of clinical indicated imaging may add significant insights in medico-legal investigation which effects may be of major help in the criminal law system.

Keywords: medico-legal investigation; forensic imaging; CT scans; clinical forensic medicine.

POST MORTEM CT-ANGIOGRAPHY: EXPERIENCES AND PRACTICAL APPLICATIONS

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Post mortem computed tomography angiography (PMCTA) represents one of the current trends in forensic imaging, with increasing adoption in modern forensic centers, particularly in Western Europe. Nonetheless, the establishment of definitive methodology and guidelines for angiographic techniques after death remains an ongoing challenge. Our experience underscores the necessity of collaborating with perfusionists skilled in extracorporeal circulation to successfully integrate PMCTA into routine forensic practice. With minimal equipment and preparatory efforts, PMCTA offers a streamlined and efficient diagnostic approach. Its key benefits include minimal invasiveness and high-quality visualization of arterial and venous vessels, addressing a long-standing challenge posed by the limitations of conventional dissection techniques. The authors present the initial deployment of PMCTA at the Department of Forensic Medicine, Faculty of Medicine in Hradec Králové, Charles University, and University Hospital Hradec Králové. They also share experiences with the application of three carrier media types (paraffin oil, polyethylene glycol (PEG), crystalloid solutions) for PMCTA outcomes, particularly in relation to post mortem interval (PMI), indications, and cause of death.

Keywords: post mortem computed tomography angiography (PMCTA); post mortem computed tomography (PMCT); virtopsy; autopsy; forensic pathology.

HOMICIDE BY COMBINED ASPHYXIA OF INTRAORAL AND INTRANASAL INSERTION OF OBJECTS AND MANUAL STRANGULATION

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A homicide case of asphyxia due to intraoral and intranasal insertion of objects and manual strangulation is presented. The burnt body of a 94-year-old male victim was found after a house fire. Apart from multiple injuries, a rounded tube-like metallic object was observed in the nose, and a curved, flat metallic object was observed in the mouth. The investigators decided to remove the objects during the crime scene examination. It turned out that the object in the nose was a copper tube bent at 90°, while the object in the mouth was a tire lever.
Prior to the autopsy, a PMCT (post-mortem computer tomography) was performed, which found a linear skull fracture of the left frontal, impression fracture of the right temporal bone, fracture of the neck and head of the left side of the mandible, hyoid bone fracture, thyroid cartilage fracture and rib fractures.
Prior to the autopsy, replicas of the removed metallic tools were created by 3D printing (three-dimensional printing) based on the photographs provided by the police.
The autopsy was performed with a special focus on the nasal and oral cavity; the 3D-printed replicas were inserted back into their original positions. An autopsy revealed a fracture of the nasal septum and a circular fracture without displacement on the orbital lamina of the ethmoid bone not detectable by PMCT. An autopsy revealed no fracture on the frontal bone.
A laceration and submucous bleeding were found on the mouth palate, but no fracture could be observed. Apart from the fractures, multiple hemorrhages were found in the laryngeal region.
Histological examination revealed hemorrhage in the nasal palatal and laryngeal mucosa. The hemorrhage of nasal and palatal mucosa proved that the objects were inserted antemortem into the nasal and oral cavity.
The cause of death was determined as combined asphyxia of foreign body airway obstruction (choking) and manual strangulation. The case demonstrates the value of applying PMCT and 3D printing before and during the autopsy but also illustrates the limitations of conventional (non-contrast enhanced) PMCT.

Keywords: homicide; choking; strangulation; PMCT; 3D printing.

THE IDENTIFICATION OF A OFFENDING TOOL: A NOVEL CASE-INSPIRED APPROACH

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This paper first presents a real case of a murder of a young woman, with the offending tool being unknown for several weeks. The efforts to identify the offending tool gave rise to collaboration with the VSB-Technical University of Ostrava, which involved testing a new method based on the analysis of the microparticles and nanoparticles. Since the use of the method in this case was promising, it served as inspiration for a pilot study to develop and test the method further. It may be especially useful in countries where sharp force fatalities account for a majority of homicide cases, which is the case of most European countries, with strict gun control legislation in place.

The pilot study put into test a novel method using a combination of (i) direct slide impression to collect microparticles from stab wounds caused by different types of knives and (ii) automatic scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS). For the purposes of the pilot study, pork belly was used to simulate human skin. A total of five knives of different quality were used to inflict the stab wounds into the pork tissue, and subsequently microscope slides were used to make impression samples directly from the wounds. An analysis of the chemical composition and stereomicroscopic examination of the knives was also carried out.

The results showed that the differences in the properties and quality of the knives resulted in varying amount and chemical composition of particles left by the knives in the stab wounds; such finding are useful as they may contribute to the identification of the offending tool in many cases. This study presents a new method that offers promising potential for identifying offending tools in cases of sharp force induced wounds and thus could become another robust method in the forensic expert's toolkit.

Keywords: nanoparticles; forensic pathology; sharp force trauma; offending tool identification; automatic SEM-EDS analysis.

PROBLEMS AND ACHIEVEMENTS OF THE FORENSIC MEDICAL SERVICE OF UKRAINE IN CONDITIONS OF FULL-SCALE WAR

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Full-scale conflicts involving a large-scale invasion of one country by another using all types of weapons, including aircraft and missiles, are a rare occurrence since World War II. After the war in Yugoslavia, Europe has not seen a conflict that would lead to such mass casualties, a significant number of internally displaced persons and destruction as during Russia's full-scale invasion of Ukraine in 2022. The need to examine numerous victims, including victims of torture, rape, a sharp increase in deaths from gunshot and explosive injuries, and the exhumation of mass graves became an impetus for the development of the forensic medical service in Ukraine. At the same time, this also revealed weaknesses in the service, which were manifested in a weak material and technical base, limited resources, outdated legislation, and poor familiarity of experts with international protocols related to forensic medical examination. Over the 3 years of full-scale war, it is worth noting several positive changes/trends related to them, which concern the forensic medical service, namely: reorganization of the forensic medical service and the final accession of all its structural units to the Ministry of Health of Ukraine with increased centralization of management; improvement of the material and technical base, including provision of the bureau with autonomous generators; restoration of the internship in forensic medicine, the duration of which is 1.5 years; conducting master classes to familiarize Ukrainian experts with international protocols and exchange experience with foreign colleagues. On the other hand, many other issues still remain unresolved: outdated legislative framework for forensic medical examination, which has not been updated for 30 years; the absence of regulatory documents that generally regulate the activities of a forensic medical expert (such as examining a corpse at the scene of the incident); weak financial support for the expert, which complicates his independent status; uneven development of forensic medical bureaus and experts, which varies from region to region. However, despite all the challenges that the forensic medical service faced in the conditions of a full-scale war, the system is functioning fully and to the fullest extent, fully fulfilling all its functions. Further exchange of experience and application of international protocols, together with exchange of experience and organization of internships for forensic experts from Ukraine in other countries and vice versa, is the most optimal option for further growth of forensic medicine capacities.

Keywords: forensic medical service; Ukraine; Russian invasion; organization.

MAY OR SHOULD EXPERTS OF FORENSIC MEDICINE BE ALSO THE EXPERTS OF HEALTH LAW?

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The medical expert must give a scientific based medical opinion in front of the court. The expert doesn't have any competency in legal questions, it is forbidden to set legal opinion or to tell the court, 'how to verdict'.
However, my daily experience is different, particularly in malpractice cases and sues for any health damages, where not only professional requirements are analyzed, but the jurisdiction needs profound knowledge and understanding of the health law regulations. Do medical experts know the health law? Do the practicing physicians know the health law?
The author has more than 30 years' experience in teaching health law for medical professionals, including forensic medical experts, law students and lawyers. In the graduate curriculum in Hungary medical student learn health law at the forensic studies, which concentrates the criminal law, unnatural death regulations and some points of patient-physician relationship, but health law is only tangentially involved. During residency and specialization training some points of labor regulations, health insurance and the basic regulations of the specialization are studied. Legal topics are relatively rare when the professional or scientific associations organize conferences.
In the postgraduate forensic studies, the principles of the criminal and civil law, procedural law and basic regulations for the forensic experts are the part of the mandatory program, health law is not built in.
Health law is an endless project. In Hungary almost 700 legal regulations are in force for the health care, several hundreds for the pharmaceuticals. It is impossible to know all of them. Forensic medical experts should know - at least – the basic norms, and the structure of the regulatory system for finding the legal regulations and for separating them from the by-laws, like guidelines and protocols.
Lawyers also have only a minimal number of mandatory lessons in health law, focusing on the structure, management and control of the health care system and some patients' rights. The specialization of the lawyers gives some chance to have specialized personnel.
The presentation gives five short case study examples to demonstrate that forensic experts must answer legal questions in pharmaceutical, patient safety and patients' rights, the role of European Union and other international guidelines and recommendations, and social care areas.
Our conclusion is that medical experts need deeper knowledge of health law and must give a legal background for their professional opinion but never make legal decisions.

Keywords: medical expert, health law, competency, health law studies.

SIMULATION METHODS IN THE EDUCATION IN FORENSIC MEDICINE

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Modern undergraduate medical education cannot currently do without the use of simulation medicine. Traditionally, simulators are used for teaching in clinical medicine, especially for practicing life-saving procedures. However, the use of simulation medicine is much broader and in 2024, the Simulation Centre of the Faculty of Medicine of Masaryk University (SIMU) started simulated teaching in the subject of Forensic Medicine. The subject of the pilot simulation was the examination of a deceased body outside a medical facility, the practical mastery of which is a necessary outcome of the subject of forensic medicine at medical faculties. The paper describes the experience with the use of simulation medicine in forensic medicine and presents an example case.

Keywords: simulation medicine; medical education; forensic medicine; crime scene.

PATCHWORK OF INJURIES: THE CHALLENGING TASK OF THE FORENSIC MEDICINE EXPERT

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Forensic Medical Experts rarely have the opportunity to physically examine the victims of bodily harm in countries where clinical forensic medicine has not yet been introduced into everyday practice. Therefore, they have to rely on the description of the injuries contained in the medical reports created by clinicians.
Our goal was to examine the limitations of this practice: how frequently specific injury characteristics appear in the medical documentation, what the most common mistakes are, and to what extent it is possible to provide a substantive opinion based on these clinical documents.
Forensic medical reports of 132 victims of bodily harm during a two-year period covering the years 2023–2024 were analyzed. The number of recorded injury characteristics and the accuracy of injury description were analyzed and compared with the forensic medical conclusions.
The clinical documentation of the 132 victims contained 384 injuries. In most cases, essential descriptive details of the wounds were missing. Due to these deficiencies, even after considering also other available data (such as photographs, video records, testimonies and other investigative data), the forensic medical expert was unable to provide an opinion about the mechanism of 13 injuries, and only an uncertain opinion could be formulated about the mechanism of 54 injuries. The clinical description almost never contained any information which could be used to date the injuries.
The results draw attention to the importance of precise documentation of injuries, which would require more emphasis on injury descriptions during undergraduate and postgraduate education. The ideal solution, however, would be implementing clinical forensic medicine into everyday practice.

Keywords: injury; bodily harm; documentation; injury characteristics; clinical forensic medicine

THE ROLE OF LITERATURE IN SUICIDE: A CASE REPORT OF A CHILD WHO WAS ASSISSTED BY A BOOK TO COMMIT SUICIDE

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This paper will discuss the effect of self-help (suicide assistance books and websites) on suicide rates. The presentation will be reviewing a case of a child who used a suicide help book to commit suicide using (Sodium Nitrite) which is an organic compound that is not readily detected in toxicology screening but rather only show a high methemoglobin level, the book also gave the child means to find and acquire Sodium Nitrite, teaching him administration methods and what other medications he could use to stay calm so that he would not retract his decision to commit suicide. the presentation will further discuss the dangers of having these kind of books and websites on depression patients or other psychiatric illnesses. Moreover, It will discuss the effect of (Suicide means restriction) on the rate of suicide by doing a review of articles using Pubmed, MedlinePlus, Google Scholar, Elsevier. The presentation will invoke thought on whether such publications and websites should be restricted or prohibited especially for children and psychiatric patients. It will also relay the effect of glorification of suicide and its easy accessibility on the rate of suicide. It will also discuss the challenges faced when diagnosing Sodium nitrite poisoning.

Keywords: sodium nitrite; methemoglobinemia; ethics; suicide.

PARENTAL VIOLENCE AND ACADEMIC FAILURE: WHEN A CHILD'S LIFE DEPENDS ON SCHOOL GRADES

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Parental violence related to school performance is a worrying and often underestimated phenomenon that can have serious, even fatal, consequences on children's well-being and lives. This article presents three clinical cases illustrating the tragic impact of academic failure in a context of family violence.

The first case involves an 11-year-old boy who died as a result of severe head trauma inflicted by his father after poor academic results. The second case describes a 15-year-old adolescent who suffered physical abuse, initially consulted for a throat infection but showing signs of previous violence. The third case reports the suicide of a 12-year-old child following repeated abuse after poor school performance.

Analysis and discussion: The analysis of these cases highlights the correlation between academic failure and parental violence. The clinical implications underline the importance of early recognition of signs of abuse and appropriate intervention. This study also draws on literature data, including international studies, to compare and deepen the understanding of this phenomenon.

Conclusion: The cases presented demonstrate the need to raise awareness among healthcare professionals and society as a whole about the consequences of excessive parental pressure on children. Preventive and educational actions must be strengthened to reduce the incidence of violence and protect the mental and physical health of children.

Keywords: parental violence; academic failure; child abuse; child health; prevention.

FORENSIC MEDICINE AND MASS DISASTERS: FROM ANTHROPOLOGY TO GENETICS IN THE IDENTIFICATION OF 27 ITALIAN SOLDIERS FROM THE WWII MASS GRAVE OF OSSERO

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Introduction. Forensic medicine plays a crucial role in identifying human skeletal remains, particularly those recovered in mass disasters or from mass graves. This project aimed to identify 27 Italian soldiers killed in April 1945 and buried in a mass grave in Ossero (Cres Island, Croatia). The remains were exhumed in 2019 by Croatian authorities, and investigations began in 2022 following an agreement between the Italian Ministry of Defence and the Universities of Bari and Trieste.
Materials and methods. The remains have undergone radiographic and anthropological analyses to assess minimum number of individuals, sex, age, stature, and traumatic injuries. A total of 341 samples were collected and designated for genetic comparison. DNA was extracted from 131 bone samples—including petrous bones, femurs, metacarpals, and metatarsals—and 16 molar teeth. Autosomal and Y-chromosome STR profiles were obtained using conventional capillary electrophoresis (CE), while a set of 76 microhaplotypes was analyzed using massively parallel sequencing (MPS). 21 living subjects, related to 14 missing soldiers, were avaiable as reference samples.
Results and Discussion. Anthropometric analyses revealed incomplete and commingled remains of at least 32 individuals, aged 15–45 years and 161–181 cm tall, including at least three females. At least 20 gunshot wounds were scored, as well as several peri-mortem fractures. Genetic testing revealed 24 different autosomal consensus male profiles and confirmed the presence of female profiles (six), with the petrous bone proving to be the best-performing element. The male *post-mortem* profiles were compared with the *ante-mortem* database. The DVI module of the Familias software was employed to calculate likelihood ratios (LRs) and posterior probabilities (PP). The combined analysis of autosomal STRs and microhaplotypes identified six victims. In four cases involving distant victim–relative relationships, low LR values were observed for autosomal markers; however, shared Y-STR haplotypes provided strong evidence supporting paternal lineage connections.
Conclusions: The extensive commingling and missing skeletal elements impeded an accurate skeletal reconstruction, emphasizing how a poor scene management can limit the effectiveness of the identification process. Although the genetic analysis allowed us to identify 10 soldiers, it certainly cannot disregard a multidisciplinary approach and the use of qualified personnel throughout the entire workflow. Finally, cooperation between Government authorities should be promoted more actively.

Keywords: disaster victim identification; skeletal remains; DNA analysis; PCR-MPS.

SWISS DVI INTERVENTION IN ISRAEL FOLLOWING THE HAMAS ATTACKS OF OCTOBER 7TH 2023.

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On October 7th 2023, Hamas members infiltrated Israeli territory, killing approximately 1200 people with small arms and explosive devices. Large numbers of Hamas members were also killed during this attack and their bodies left in Israel. When they were recovered, numerous bodies were disfigured, severely burnt or in advanced states of decomposition, which complicated the identification procedure. All the bodies were first examined by the scientific police and forensic odontologists in an Israeli military base. All those that were not identified after this first step were later transferred to the Tel Aviv forensic medicine center for a more in depth examen by forensic pathologists, radiologists and anthropologists. Most of the bodies were identified via DNA testing. When DNA testing was unsuccessful, for example in carbonized remains, other odontological, radiological and anthropological identification methods were attempted. Israel made a request for assistance to Switzerland, after which a team of three forensic pathologists and two policemen, all DVI (Disaster Victim Identification) members, went to Israel from 15 to 23 October 2023 to assist in the identification procedures.

Keywords: DVI; mass death event; Israel; identification.

FROM BONES TO BYTES: INTEGRATING AI INTO FORENSIC ANTHROPOLOGY

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The rapid expansion of accessible artificial intelligence (AI) technologies is transforming forensic sciences—particularly forensic anthropology, a field traditionally less exposed to technological innovation. Recent advances in large language models (LLMs) enable detailed analysis of complex skeletal structures and empower forensic anthropologists to independently develop both conventional and cutting-edge AI tools, reducing reliance on external technical expertise.

Building on insights from the CTforID project (Forensic identification of human remains using MSCT image analysis), we demonstrate how LLM-guided coding can be used to create biological profiling methods based on measurements, categorical scores, 3D landmark data, 2D images, and complete 3D skeletal models. These models facilitate key forensic tasks such as sex and age estimation, while providing adaptable frameworks for cross-population validation.

By integrating 3D data with LLM-driven development, we bridge the gap between forensic needs and technical implementation. We highlight how AI, particularly 3D neural networks (NNs), enhances anthropological analysis and supports sustainable tool development. Practical examples will be presented alongside discussions of real-world applications, challenges in ensuring model accuracy and interpretability, and strategies to empower forensic scientists to effectively adopt these technologies in their work.

Keywords: forensic anthropology; artificial intelligence; 3D neural networks; large language models; biological profiling.

„TALES FROM THE CRYPT" - RESULTS OF THE FORENSIC EXAMINATION OF THE REMAINS IN MASS GRAVE NO. III, MOHÁCS, HUNGARY

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The authors present the results of the forensic examination of one of the five known mass graves connected to the most significant late middle-aged battle in Hungary. Our previously presented preliminary results showed perimortem injuries suggesting execution rather than battle-field injuries. For more meticulous examination, a representative sample of 45 remains were chosen via „expert selection" from the ca. 350 remains of the mass grave, in order to determine injury patterns. With the help of both traditional forensic methods and modern medical imaging techniques, we analysed the potentially fatal injuries and those considered to be the immediate cause of death. We found that in nearly two-third of the selected sample cases, death was caused by a sword strike to the occipital area adjacent to the spine and the C1-C3 vertebrae, inflicted from behind, causing spinal chord injury. In about one-third of the cases, death occurred due to a large cervical vessel injury caused by a sword strike to the face and neck inflicted front-wise. This new data, together with the multiple repetition of the strikes and a non-random pattern of non-fatal injuries, strengthens the hypothesis of mass execution without the primary intention of decapitation.

Keywords: bone injuries; mass grave; sharp injuries; cone-beam CT; decapitation.

MANAGEMENT OF HOMELAND WAR MASS GRAVES: FORENSIC ANTHROPOLOGY INSIGHTS AFTER 30 YEARS

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This presentation examines the management and analysis of commingled mass graves resulting from the Homeland War, emphasizing the vital role of forensic anthropology 30 years after the conflict. Special attention is given to DNA-led victim identification efforts, which assist in resolving commingled remains and revising previously unresolved (NN) cases. The Ministry for Croatian Veterans coordinates these efforts, ensuring a multidisciplinary approach to solving case complexities. Case studies will demonstrate how these strategies have contributed to providing closure for families and improving the effectiveness of long-term forensic investigations. The insights highlight the importance of institutional cooperation in mass grave management in post-conflict settings.

A LATE ON-SET PSEUDOANEURYSM OF THE VASCULAR PEDICLE AS A RARE COMPLICATION AFTER GRAFTECTOMY

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Anastomotic pseudoaneurysm is one of the rarest vascular complications in transplantation medicine. It can appear years after transplant nephrectomy and usually remains silent, located on the anastomotic side, prone to acute rupture, which leads to massive, fatal bleeding. We report a case of patient with a history of three kidney transplantation, who developed anuric acute kidney injury with oval shaped formation in peritoneal cavity, that was located in a place after graftectomy of the first kidney transplant. Before further investigation could be conducted, the patient had circulatory arrest with unsuccessful cardiopulmonary resuscitation. The cause of kidney failure and death was clarified by the autopsy with surprising conclusion. Microscopic examination was performed to confirm an initial autopsy finding. To our knowledge this is one the first descriptions of an unusual complication in a patient occurred years after transplant nephrectomy.

Keywords: extrarenal pseudoaneurysm; kidney transplantation; graftectomy; acute kidney injury; autopsy finding.

FORENSIC PSYCHIATRY SYSTEMS IN EUROPE: A ROMANIAN PERSPECTIVE

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Forensic psychiatry is a specialized branch of psychiatry situated at the intersection of mental health care and criminal law. This paper offers a focused overview of forensic psychiatric systems across Europe, with particular emphasis on the institutional, legal, and procedural framework in Romania. While countries such as Germany, the United Kingdom, and the Netherlands have developed well-structured forensic infrastructures—including specialized hospitals, clear legal criteria for involuntary admission, and multidisciplinary treatment protocols—Romania faces significant systemic challenges. These include the absence of dedicated forensic psychiatric facilities, limited legal clarity concerning psychiatric responsibility and restricted access to structured rehabilitation programs. By comparing legislative frameworks, institutional models, and admission procedures, the study reveals discrepancies in clinical pathways across countries. In the Romanian context, the lack of a national registry for forensic cases, delays in legal processing and the weak integration between mental health services and the judicial system are especially problematic. Drawing on recent European guidelines and comparative studies, this paper identifies areas for potential reform and alignment with EU standards, highlighting the need for clearer legislation, dedicated infrastructure and effective cross-sector collaboration among psychiatry, law and social services.

Keywords: forensic psychiatry, mental health, criminal law, social services, forensic cases.

FORENSIC AND SOCIAL PERSPECTIVES ON MASS MURDER: LESSONS FROM TWO CASES IN THE SAME TOWN

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Introduction: Mass murders have always been a significant concern that leaves a deep mark not only on the families of the victims but also on the whole society, and when that happens in small communities, the trauma can be especially highlighted. The data obtained by autopsies in cases of mass murders can represent data that provides insight for developing preventive measures. The focus of this study is on the analysis and comparison of data obtained by autopsies from two mass murders that took place within 2 years and 5 months in the same town in Montenegro. Notably, in both events, the killers knew their victims, and some even had family ties. Additionally, medical records show that both killers had borderline psychiatric disorders.
Methods: The research was designed as a retrospective study based on full forensic pathology autopsies in both cases of mass murders, where age, gender, number of firearms wounds, localization of wounds, and causes of death were analyzed.
Results: The results show that the victims in the first case of mass murder (2022 year) had an average of 1.7 firearm wounds on 11 autopsies, while in the second mass murder (2025 year), the average was 3.08 on 13 autopsies. The distribution of firearm wounds in both cases was most often in the head, with a total of 8 wounds in the first, and 11 in the second mass murder. In the second mass murder, there were more multiple firearm wounds with only two single-shot wounds, while in the first case of mass murder, there were 6. The close relationship between the killers and the victims points to the possibility of psychological and social triggers.
Conclusion: Understanding the patterns in 2 mass murders that happened 2 years and 5 months apart in the same small town can provide a better insight into the motives and triggers, the response of the emergency services, primarily the police, and the preventive strategies that need to be created. The cases emphasize the connection between borderline, insufficiently recognized and treated psychiatric conditions, and the mass shooting events, where killers had personal connections to their victims. Also, the response of law enforcement services in mass shooting situations must be faster since killers in both cases spent an unexplainable long time entering other people's houses and walking down the streets while carrying out cold-blooded murders.

Keywords: mass murder; firearm injuries; law enforcement response; homicide patterns.

PERFORMANCE OF FORENSIC AND CLINICAL AUTOPSIES IN SLOVAKIA

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Introduction: Role of the autopsy in the system of quality assessment in health care and in establishing the cause of death in so called non treated population and in the cases of violent deaths is irreplaceable. Over the last decades of the 20th century and the first two decades of the 21st century we have been witnesses of a decreasing autopsy rate at global, European and national levels. A new institution – Health Care Surveillance Authority (HCSA) – for the management, and new network of workplaces for performance of pathological anatomical (clinical) and medico-legal autopsies in Slovakia was established in 2004. The objective of this paper is to explain a recent development and current situation of autopsy practice in Slovak republic from a forensic medicine point of view.
Material and Methods: There was made an analysis of the development of autopsy rate in the years 1995 – 2024 and development of absolute numbers of performed autopsies according the "type" of autopsy in the years 2005 - 2024. The statistics data for the purpose of this analysis were acquired from the Statistical Office and the Health Care Surveillance Authority.
Results: Autopsy rate decreased in the years 1995 – 2004 from 18.3% to 12.5%. In the years 2005 – 2024 according to the data from the HCSA autopsy rate in the above mentioned period ranged from 18.1% to 11,56%. The total number of autopsies in the years 2005 – 2024 in absolute numbers decreased from 9,677 to 6,226. The number of medico-legal autopsies decreased from 4,438 to 3,721. The number of clinical autopsies decreased from 3,724 to 1,759. The number of autopsies ordered by police and connected with expert opinions decreased from 1515 to 746. There was relative increase of the rate of medico-legal autopsies in comparison with the total number of all performed autopsies from 46% to 60% due to considerable decrease of number of clinical autopsies.
Discussion and Conclusion: In spite of the fact that a new institution centrally managing performance of autopsies was established, a current development in this field shows that a tendency of autopsy rate decrease is progressive and permanent also in Slovak republic.

Keywords: forensic autopsy; clinical autopsy; autopsy rate; Health Care Surveillance Authority; Slovakia.

FORENSIC PATHOLOGICAL ASPECTS OF INSULIN PUMPS

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Diabetes is a major global public health issue, contributing to high rates of morbidity and mortality. Managing diabetes mellitus often requires careful administration of exogenous insulin to control blood glucose levels effectively. Traditional insulin pumps and the increasing use of Automated Insulin Delivery (AID) systems - comprising a continuous glucose monitor, an insulin pump, and a control algorithm for automatically adjusting subcutaneous insulin delivery - are becoming more accessible to individuals with diabetes. In forensic pathology, medical devices play a critical role in death investigations by supplying essential data that aids in identification, as well as in determining the time and cause of death. Additionally, they assist in investigating fatalities linked to these devices. Nonetheless, the specific role of insulin pumps in this context remains inadequately understood. Therefore, this systematic review explores insulin pumps' potential forensic pathology implications. To gather relevant data, three databases - PubMed, Scopus, and Web of Science - were searched. Among 941 screened abstracts, 17 studies were selected for inclusion. The cases are discussed in terms of their applications in forensic pathological practice. Although cybersecurity concerns associated with insulin pumps and AID systems were not included in the final analysis, the review also addresses key questions related to these issues.

Keywords: insulin pump; autopsy; forensic pathology; cause of death; systematic review.

THE IMPORTANCE OF COMBINING FORENSIC METHODS IN IDENTIFYING HYPOTHERMIA AS A CAUSE OF DEATH: CASE REPORT

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Introduction: Prolonged exposure of the human body to low temperatures can lead to hypothermia-related deaths, which presents a significant challenge in forensic medicine. Hypothermia is a condition that occurs when the core body temperature is approximately 2 °C below physiological temperature (37 °C) and can be classified as mild, moderate and severe. While primary hypothermia is a result of environmental exposure without an underlying health condition that disrupts temperature regulation, secondary hypothermia is influenced by other etiological factors, such as alcohol intoxication and certain medications. The aim of this study is to demonstrate the critical role of integrating multiple factors in diagnosing hypothermia, highlighting the importance of a holistic approach for accurate forensic evaluation.
Methods: In this study, we report the case of a 46-year-old man who was found buried under the snow on mountain Bjelašnica, after four days of search. The incident took place in the winter month December in 2024.
Results: Autopsy findings (macroscopic): The man's skin was overall pale, with pinkish postmortem lividity, due to preserved oxygenated blood. As a result of muscle rigidity and freezing a sardonic smile was observed in the deceased individual. Frostbite erythema and cyanotic nail beds were noticed on both hands, most likely due to prolonged exposure to death. The presence of small brownish erosions in the stomach mucosa, known as Wischnewsky ulcers, was revealed during the internal examination.
Microscopic analyses: Histopathological examination of deceased lungs and brain showed signs of significant edema. The stomach mucosa exhibited hemoglobin hematinization in the superficially located gastric glands, representing an incomplete form of Wischnewsky spots. The deceased pancreas showed signs of autolysis. The skeletal muscle cells showed no signs of abnormalities.
The histopathological examination confirmed the hypothermia as a cause of death. To exclude the possibility of secondary hypothermia, toxicological samples have been taken.
Conclusion: Due to absence of specific histopathological signs of hypothermia, this case report highlights the importance of combining all factors and diagnostic methods that contribute to identifying hypothermia as a possible cause of death.

Keywords: forensic; autopsy; hypothermia; Wischnewsky spots; histopathology.

FATAL RECTAL RUPTURE BY COMPRESSED AIR

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Introduction: Compressed air is air kept under a pressure that Is greater than atmospheric pressure. Compressed air is widely used for both Industrial and domestic purposes. Since it stores large amounts of energy at high pressure, Injudicious use may lead to grave Incidents at the workplace. A misdirected jet of compressed air to the head can cause serious eye Injuries or rupture of the eardrum. Aiming the compressed air Into the mouth can damage the lungs and esophagus. Careless use of compressed air to blow away dirt or dust from the body, even with a protective layer of clothes, could allow the air to enter the body, which can damage the internal organs.
Case report: An adult male aged 32 Years was a worker in the car service center. He was made the victim of a practical joke by his colleagues who approached him from behind, insufflated the compressed air through anal route using the compressed air cleaner. The said air cleaner was being used to clean off the dirt from the cars at the service center. Following which, the victim complained of severe abdominal pain and hence was taken to a hospital where he died suddenly.
Conclusion: The case highlights the need for implementation of guidelines for safe handling of compressed gases and it also calls for appropriate work place etiquette to avoid such fatal practical jokes at work.

Keywords: compressed air; transanal-barotrauma; traumatic colon rupture; safety guidelines.

A RARE CASE OF FATAL LIGHTNING STRIKE IN DAMMAM WITH UNUSUAL CUTANEOUS FINDINGS

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Determining the cause of death in lightning strikes could be easily reached if the circumstances were witnessed or if typical kerauno-pathologic features were found on the body. However, in rare cases, certain unusual skin features are found, which makes attribution to the cause of death more difficult, especially if unwitnessed. In this case, a witnessed lightning strokes a 42-year-old male while he was walking outdoors in a rainy day, leaving him with a rare finding of punctuate burns over the back of the body (crocodile skin) and nonspecific internal organ findings. The clothes were burnt and shredded, and the hair of the affected area was singed. Rare findings of lightning strikes need to be reported as they can be the key in leading investigations in unwitnessed strikes.

Keywords: burn, electrocution; forensic medicine; lightning strike; skin manifestations.

"NO ONE CAN HELP US ANYMORE…"

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In April 2022, a small village in the Vsetín district, Czech Republic, was shocked by an explosion that seriously injured a thirty-one-year-old man. At that moment, his wife and their three children under the age of six went missing. After several hours of investigation, they were found partially buried in the rubble of the family home. However, the death of the victims was not caused by the explosion nor thermal changes. The authors' contribution offers a probe into the motive of multiple murder that should have led the father of the family to kill his wife and children. The authors address the forensic challenges associated with autopsies of thermally altered bodies. The obscure toxicological findings initiated a discussion on the assessment of carboxyhemoglobin levels in blood samples as an indicator of vitality in individuals found in fire scenes.

Keywords: familicide; murder; paranoia; crime scene.

HOMICIDE-SUICIDE EVENTS IN SLOVAKIA

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Introduction: The term homicide-suicide refers to a situation in which an individual kills one or more people and subsequently commits suicide. In most cases, suicide occurs almost immediately. Homicide-suicide cases include a wide range of events that have been variously interpreted as homicide following suicide, dyadic death or extended suicide, or even suicidal pacts. In recent years, this type of event has received increased interest from both academics and the public.
Material and Methods: There was performed a retrospective-prospective study of the autopsy protocols of the Medico-Legal Department of the Healthcare Surveillance Authority in Bratislava, Slovakia, in a period of 15 years (2010 – 2024). We performed the analysis of homicide-suicide cases in Bratislava and Trnava regions. Our focus was on gaining further information about the background of these incidents and on the available police records. In all cases, the crime scene analysis, autopsy and additional laboratory examinations were conducted.
Results: In 30 events, a total of 59 people died and 5 survived. The perpetrators were male in 97% of the cases and female in 3%. Of the victims, 74% were women, 23% were men and 3% were children. In 77% of cases, the incidents included a spouse or intimate partner relationship. In 50%, the crime scene took place in a domestic setting. The main triggers for the acts were marital/partner conflicts and financial problems. In 47% of the cases, the method of choice was shooting and in 23% of the cases, stabbing with a knife.
Conclusions: Although homicide-suicide is rare, it is a very serious form of interpersonal violence that occurs mainly in intra-familial settings. These acts are mostly carried out by men, the victims are most often female intimate partners or close family members; multiple victims are also common. The investigation of motivation in these cases is of great importance from a forensic-psychological point of view. Motivations include jealousy followed by revenge, relationship breakdown, altruism or mercy killing, financial problems, social stressors and mental disorder. Reliable information on the role of mental disorder in these cases is lacking. It is challenging to determine a person's mental state at the time of the offence and to retrospectively identify personality traits in the deceased offender. Emphasis should be placed on developing prevention and recognizing risk factors.

Keywords: homicide-suicide; assault; cause of death; motive.

HYPOGLYCEMIA-ASSOCIATED HEPATIC LESIONS IN FATAL INTOXICATIONS: A POSTMORTEM ANALYSIS

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Introduction: Fatal intoxications represent a significant challenge in forensic medicine, particularly when associated with metabolic complications such as hypoglycemia. This study focuses on accidental intoxications in Sidi Bel Abbès, Algeria, examining four cases of individuals aged between 33 months and 26 years. These cases involved patients admitted with severe hypoglycemia (blood glucose levels at admission: 0.20 g/L) and varying hospitalization durations, ranging from 2 hours to 9 days in pediatric and adult intensive care units.
Objectives: This analysis aims to identify hepatic lesions associated with fatal intoxications, emphasizing hypoglycemia-induced hepatolysis and steatosis.
Methods: Four victims of accidental intoxications were retrospectively analyzed. Autopsies were performed to assess hepatic lesions, alongside clinical data including age, hospitalization duration, and biochemical parameters. Histopathological examinations focused on identifying steatosis, hepatocyte necrosis, and glycogen depletion. The toxicological context of each case, including potential substances involved, was evaluated.
Results: The victims presented with pronounced hypoglycemia, leading to rapid clinical deterioration. Autopsy findings revealed:
1. Steatosis: Observed in all cases, particularly microvesicular, suggesting metabolic disruption.
2. Hepatolysis: Hepatocyte necrosis and extensive glycogen depletion were prominent, especially in cases with prolonged hypoglycemia.
3. Toxicological context: Substances implicated included household cleaning agents and medications, commonly ingested accidentally.
The hospitalization duration influenced lesion severity, with longer stays allowing partial metabolic compensation.
Discussion: These findings highlight the critical role of hypoglycemia in exacerbating hepatic damage during intoxications. Hypoglycemia may result from impaired gluconeogenesis and glycogenolysis, driven by toxic substances and metabolic exhaustion. Pediatric cases demonstrated heightened vulnerability due to limited hepatic reserves. Rapid progression from metabolic dysfunction to multi-organ failure underscores the need for early recognition and intervention in hypoglycemic intoxications.
Conclusion: This study emphasizes the forensic relevance of hypoglycemia-associated hepatic lesions in fatal intoxications. Preventive strategies should target accidental poisoning risks, particularly in vulnerable populations. Enhanced public awareness, child-proofing hazardous substances, and rapid medical response protocols could mitigate fatalities. Forensic autopsy remains a vital tool in elucidating the pathophysiology of such cases, aiding in prevention and management efforts.

Keywords: autopsy; intoxications; hypoglycemia, accidentally, hepatic lesions.

RETROSPECTIVE ANALYSIS OF FENTANYL IN POSTMORTEM SAMPLE DURING THE PERIOD FROM 2019. TO 2024.: FOUR CASE REPORTS

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Fentanyl is highly potent synthetic opioid encountered in forensic casework worldwide.
This study presents a retrospective analysis of cases in which fentanyl was confirmed in postmortem biological specimens (blood, urine, bile and gastric content) during the period from 2019. to 2024. at the Department of Forensic Medicine in Zagreb, Croatia.
Initial screening was performed using the DOA MultiGnost immunoassay panel, which indicated fentanyl presence in 33 cases. Confirmatory analysis was performed with gas chromatography-mass spectrometry (GC-MS), which confirmed the detection of fentanyl in 10 of these cases.
Four representative cases were selected based on their toxicological profiles, fentanyl detection, the presence of other medications and the circumstances of death.

Keywords: fentanyl; postmortem toxicology; synthetic opioids; immunoassay screening; GC-MS.

ARTIFICIAL INTELLIGENCE-BASED MEASUREMENT OF POSTMORTEM PUPIL-TO-IRIS RATIO: INFLUENCE OF DRUG CONSUMPTION

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Background: Postmortem ocular changes have historically been regarded as unpredictable due to early muscle relaxation and decomposition. However, the hypothesis that residual pharmacological effects may persist and influence ocular dimensions remains under-investigated. This study challenges conventional views by applying standardized artificial intelligence (AI)-assisted measurements to demonstrate that drug intake can have a statistically significant effect on postmortem pupil size.
Methods: Sixty eyes from thirty deceased individuals were analyzed between 24 and 36 hours after death. High-resolution digital photographs were captured under forensic-standard conditions. artificial intelligence (AI) software automatically detected and measured pupil and iris diameters, minimizing operator bias and standardizing magnifications. Pupil-to-iris ratios (PIR) were calculated and categorized into miosis (<0.25), neutral (0.25–0.55), or midriasis (>0.55) according to interquartile statistical modeling. Toxicological analyses determined the presence of psychoactive substances. Statistical analyses included descriptive statistics, chi-square testing, and outlier identification.
Results: Among the 60 eyes analyzed, 16.7% exhibited miosis and 8.3% midriasis. In toxicologically positive individuals, 27.8% displayed significant miosis compared to 8.3% among negatives. Midriasis was more common among negatives (16.7% versus 5.6% in positives). Chi-square analysis demonstrated a statistically significant association between toxicological positivity and pupil constriction ($\chi^2 = 6.70$, $p = 0.035$, $df = 2$). Outlier analysis identified 11.7% of eyes as extreme deviations beyond the normal range. Bilateral asymmetry exceeding 10% was observed in 13% of cases, emphasizing the need for independent measurements in both eyes. Scatterplot visualization confirmed that deviations were not random but clustered in subjects with substance intake.
Conclusions: This study demonstrates that postmortem pupil-to-iris ratios are not distributed randomly and may retain pharmacological signatures up to 36 hours after death. AI-based automated measurement enhances reproducibility and objectivity, offering a reliable adjunct to forensic investigations. Although pupil analysis alone cannot determine the postmortem interval or cause of death, when combined with toxicological data, it provides an early, objective indication of possible substance involvement. These findings encourage broader adoption of AI technologies to improve the precision of postmortem examinations.

Keywords: postmortem analysis; pupil-to-iris ratio; artificial intelligence; forensic toxicology; drug-related deaths.

BLOOD PHOSPHATIDYLETHANOL DETERMINATION IN FITNESS-TO-DRIVE MEDICAL ASSESSMENT: THE UNIVERSITY CENTER OF TRAFFIC MEDICINE LAUSANNE-GENEVA EXPERIENCE

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According to the Swiss law, the legal term *ability to drive* refers to the driver's momentary and incidental physical and mental capabilities to safely conduct a vehicle. The *ability to drive* safely can be impaired by, for example, alcohol, improperly used medication and/or drugs. In contrast, the legal term *fitness to drive* refers to the general physical and mental prerequisites to safely conduct a vehicle, unrelated to a specific incident or moment, relating obviously to chronic medical conditions limiting driving, which conflicts with the medical minimum requirements.
Fitness-to-drive medical assessment concerning (among others) alcohol users is a task entrusted to physicians with specific training in "traffic medicine" and known as "level four physicians".
Also, it is established that when an individual drives a vehicle under the influence of alcohol, the competent administrative authority requires a medical fitness-to-drive assessment, to exclude the possibility of "unfitness-to-drive" related to alcohol addiction or consumption habits with significant consequences on driving.
According to the current guidelines, the evaluation of alcohol consumption habits is caried out by searching for and measuring ethyl glucuronide in a 3 cm proximal segment of hair. The current guidelines, however, to not exclude the use of other biological markers, in specific situations. The search and dosage of Peth in blood samples is therefore becoming a valid alternative (or a complement) to the hair ethyl glucuronide not only in people who do not have hair, but also (and above all) in cases where it is required and expected that the person maintained (and/or maintains) absolute abstinence from alcohol, and the risk of false negative must be avoided, which cannot be excluded with EtG measurement.
The aim of this study is to illustrate the experience of our traffic medicine facility regarding the use of Peth and EtG as markers of alcohol consumption in fitness-to-drive medical assessment.

Keywords: phosphatidylethanol (PEth); alcohol consumption; traffic medicine; fitness-to-drive medical assessment; toxicology.

POSTER SESSION ABSTRACTS

FATAL ACUTE SUBDURAL HEMATOMA FOLLOWING SPINAL ANESTHESIA IN A POSTPARTUM PATIENT: A CASE REPORT

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The authors report a fatal postpartum acute subdural hematoma following multiple attempts at spinal anesthesia related to cesarean delivery. A 22-year-old primigravida was admitted to the Obstetrics and Gynecology Department due to the throes of childbirth. The presence of threatening intrauterine hypoxia indicated a C-section with the usual lumbar anesthesia. However, the anesthesia proved insufficient, necessitating the administration of intratracheal narcosis, which occurred without complication. A healthy, mature boy was born, achieving an Apgar score of 10/1 and 10/5. During the first 8 hours of the postpartum period, the primipara exhibited stable vital parameters without neurological symptoms. After 8.5 hours, a grand mal seizure was observed, following a period of consciousness and spontaneous breathing that soon ceased. The CT scan examination revealed a significant left fronto-temporo-parietal acute subdural hematoma. All brain stem reflexes were absent, with the lack of corneal, trigemino-facial, and oculo-vestibular reflexes, with submaximally dilated pupils and unresponsive to direct and consensual light stimuli. Despite an urgent neurosurgery operation and 4 days of intensive therapy, the follow-up brain CT examination showed massive midline traversing and compression of the supratentorial ventricle system. No trauma or other malformations of the brain were detected. According to the primary brain damage protocol, after a 12-hour observation period, brain death was declared, and she was deemed suitable for organ donation.

Keywords: postpartum subdural hematoma; non-traumatic subdural hematoma; fatal acute subdural hematoma; postpartum seizure.

UNRAVELING A COMPLEX SUICIDE: A FORENSIC ANALYSIS OF COMBINED METHODS

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Introduction: Suicide, defined as the conscious and intentional act of ending one's own life, is a complex phenomenon, often influenced by subjective motives, mental health disorders, and situational triggers. A suicide executed by one method is referred to as a *simple suicide*, whereas the use of two or more methods either simultaneously or in succession is termed a *complex suicide*. This approach is intended to ensure lethality- if one method fails, another may succeed. Complex suicides can be *planned* or *unplanned*, the latter occurring when a second method is improvised following failure of the first.
Case Report: A 48-year-old male was found deceased in his family home, dressed only in blood-soaked underwear and socks. No suicide note, history of mental illness, or prior attempts were reported. Forensic examiner observed blood around the nose and mouth, which is atypical in cases of hanging, prompting an autopsy. External examination revealed blood tracing from the nasal cavity, left ear, and along the torso. A ligature mark was noted on the upper third of the neck, above the laryngeal prominence. Dissection of the neck showed hemorrhage at the clavicular attachments of both sternocleidomastoid muscles, a transverse fracture of the left greater horn of the hyoid bone, and a fracture of the upper right horn of the thyroid cartilage.
Further examination of the oral cavity revealed a circular wound in the posterior third of the left hard palate, extending through the sphenoid bone into the cranial cavity. A laceration was found in the left occipital lobe and cerebellum, with a matching circular dural defect. The petrous part of the left temporal bone was shattered, forming a bone channel leading to an impacted bullet lodged in the occipital bone. Blood alcohol concentration was 0.76‰. Following autopsy findings, a firearm was located in the vicinity of the victim.
Conclusion: This case was classified as a planned complex suicide, involving both a self-inflicted gunshot wound and hanging. The atypical blood patterns and internal injuries initially raised suspicion of foul play. A multidisciplinary approach, including thorough scene investigation, medical history review, and detailed autopsy, is essential to differentiate between complex suicide and homicide.

Keywords: forensic autopsy; complex suicide; hanging; gunshot wound.

ETHICAL, LEGAL, AND SOCIAL CHALLENGES IN GENETIC PRACTICE: INSIGHTS FROM NORTH MACEDONIA

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Genetic and genomic testing plays a critical role in improving health and preventing disease. These practices involve sensitive personal data with significant implications for patients and their families, hence, it is essential to address the ethical, legal, and social implications associated with genetic practices. This study explores ethical attitudes and practices among professionals in genetic laboratories across the Republic of North Macedonia, aiming to offer guidance in line with international ethical standards, laws, and recommendations. A structured descriptive pilot questionnaire was developed using a focus group methodology and distributed via Google Forms to a targeted group of laboratory staff through email and social media. The final version included five socio-demographic and twelve ethics-related closed-ended questions. A total of 34 respondents completed the questionnaire. Most participants recognized that genetic testing differs from other medical tests and confirmed the presence of protocols protecting patient dignity. Informed consent was typically obtained in person and in writing. Many respondents reported challenges in maintaining the confidentiality of genetic data. Test results were generally delivered directly to patients, and most laboratories had designated contact personnel. Data were commonly stored in institutional databases. While most laboratories reported following international ethical guidelines, a few noted limited or no adherence. Respondents expressed a need for greater public education and better resolution of ethical issues in molecular genetics. The majority indicated that their laboratories provide patient support and counseling, and agreed that in certain contexts, public health priorities may take precedence over ethical norms. These findings underscore the urgent need for legally regulated genetic counseling centers and the gradual introduction of personalized medicine to improve healthcare in North Macedonia.

Keywords: ethics, genetic research, strategy, personalized medicine.

DNA IDENTIFICATION BY NAIL: A CASE STUDY

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In August 2024, a body with advanced decomposition changes was discovered in the Marjan forest park, Split. Based on the condition of the body, documents and money found at the scene, and an investigation of the location, it was concluded that the body belonged to a female whose disappearance had been reported in July 2024. DNA analysis was requested for final identification. One complete nail and 2 teeth were taken during the autopsy. DNA was isolated using the commercial PrepFiler Forensic DNA Extraction Kit (Applied Biosystems) and genotyping was performed using the GlobalFiler PCR Amplification Kit (Applied Biosystems). The results demonstrated that nail, comparing with tooth, contained more quantities of well-preserved and stable DNA. This case shows that nails, that are practical for collection and yield high-quality DNA, are an excellent alternative source of DNA for the needs of efficient and rapid forensic identification of the dead body with significant postmortem changes, especially if standard samples are not available or are decomposed. Using nail samples in such cases is not a standard practice. Moreover, nails are not the sample of choice in forensic medicine in the Republic of Croatia. Thus, we are of opinion that it is necessary to investigate in more detail the possibility of their use for the purpose of reliable identification.

Keywords: nail; DNA; forensics; identification; decomposition.

DRUG INDUCED DEATHS IN SPLIT DALMATIA COUNTY, 2015-2024

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The aim of this study was to examine drug induced deaths in the Split-Dalmatia County in the period between 2015 and 2024 and to analyze some of the characteristics of these deaths to help target preventive policies. The data were collected using autopsy records from the Department of Forensic Medicine, Clinical Hospital Centre Split, and School of Medicine, University of Split. In the observed period there were 94 cases of such fatalities where the cause od death was confirmed with full toxicological analyses. In less than half of them (42,5%) an autopsy was ordered by the State Attorney's Office. Out of all examined cases, 44 (46,8%) were observed in the last three years (2022-2024). The most decedents were middle-aged and majority were male. In forty-nine percent of cases a combination of several substances, especially a combination of morphine, benzodiazepines, other medications and alcohol, were found. Of the deaths involving a single drug, the legal substitution product, methadone, was the leading cause of death during the entire study period, ahead of heroin and recently cocaine. Deaths associated with use of cannabis, new psychoactive substances, and stimulants (including amphetamine-type stimulants and cocaine, especially in combination) have increased and should be closely monitored. Current systems of surveillance and communication in Croatia provide inadequate measurement of drug trends and lack a timely response to drug-related hazards.

Keywords: drug related deaths; epidemiology; forensic autopsy; toxicology.

BIOCHEMICAL MARKERS OF CELL DEATH: FORENSIC IMPLICATIONS IN DIFFERENTIATING PRIMARY AND SECONDARY HYPOTHERMIA

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Introduction: Primary hypothermia occurs when the body is exposed to extremely low temperatures in the enviornment with no underlying health conditions. Secondary hypothermia, on the other hand, results from disruptions in thermoregulation due to diseases, trauma, surgery, drugs, alcohol, or infections. Postmortem biochemistry has become a crucial factor in forensic examinations, offering valuable apprehension into tissue impairment and organ dysfunction connected with the process of dying This research aims to explore various biochemical markers and their significance for distinguishing primary hypothermia from secondary hypothermia.
Methods: This study involved 21 Wistar rats, which were separated into three experimental groups: CG-(n=7), as control group which was exposed only with hypothermic enviroments; AHG (n=7); and BHG (n=7). We tested these parameters in each rat: Urea, Creatinine, Blood Ratio Urea Nitrogen/Creatinine, Glucose, Phosphorus, Calcium, Potassium, Sodium, Ratio Sodium/Potassium, Chloride and Calculated Osmolality.
Results: Distinct biochemical discrepancies were noted between primary and secondary hypothermia. Glucose and creatinine levels exhibited significant variations ($p<0.001$). Urea concentrations also manifested notable differences inter groups ($p<0.001$). Phosphorus levels demonstrated significant differences ($p=0.004$), with significant values between the AHG and BHG ($p=0.014$) and between the BHG and CG ($p=0.014$). Potassium levels and the sodium-to-potassium ratio differed significantly ($p<0.001$). Osmolality also varied significantly across experimental groups ($p<0.001$), with post-hoc tests confirming significant differences between the AHG and CG ($p=0.013$) and the BHG and CG ($p=0.002$).
Conclusion: The calculated osmolality demonstrated significant variation among the different groups, indicating a notable impact of substances on the biochemical profile related to hypothermia. This study focused attention on the effectiveness of biochemical markers in distinguishing primary from secondary hypothermia.

Keywords: cause of death, biochemical analyses, hypothermia, experimental, rats.

HISTOLOGICAL AND IMMUNOHISTOCHEMICAL EVIDENCE IN HYPOTHERMIA-RELATED DEATH: AN EXPERIMENTAL STUDY

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Introduction: Hypothermia-related deaths present significant diagnostic challenges due to non-specific and inconsistent autopsy findings.
This study investigated the morphological and immunohistochemical changes associated with primary and secondary hypothermia in an experimental albino Norrvegicus rat model, focusing on the impact of benzodiazepine and alcohol ingestion.
Methods: Twenty-one male rats were divided into three groups: control (K), benzodiazepine-treated (B) and alcohol-treated (A). Hypothermia was induced following two weeks of substance administration, and tissue samples from multiple organs were analyzed using histological and immunohistochemical techniques. The samples stained using standard hematoxylin-eosin (HE) staining as well as immunohistochemistry techniques (including Myeloperoxidase-MPO, Epithelial cadherin-E-cadherin, CK7, and CK20). Tissue samples were taken from the heart, lungs, kidney, spleen, liver, and gastroesophageal junction.
Results: The kidney exhibited hydropic and vacuolar degeneration, congestion, and acute tubular injury across all groups, with no significant difference in E-cadherin expression. Lung samples showed congestion, emphysema, and hemorrhage, with more pronounced vascular congestion in the alcohol and benzodiazepine groups, suggesting enhanced susceptibility to respiratory compromise. Cardiac findings included vacuolar degeneration and protein denaturation, particularly in substance-exposed groups, highlighting potential myocardial stress. The spleen demonstrated erythrocyte infiltration in all groups, with increased myeloperoxidase (MPO) positive granulocytes in intoxicated specimens, indicative of altered inflammatory responses. Liver tissues revealed congestion, focal necrosis, and subcapsular hemorrhage, particularly in the alcohol group, reflecting vasodilatory effects and metabolic stress.
Conclusion: These results emphasize distinct morphological markers that differentiate primary from secondary hypothermia, including enhanced lung congestion, myocardial vacuolar changes, and hepatic hemorrhage associated with substance use. The study underscores the importance of comprehensive toxicological and genetic analyses to improve the forensic assessment of hypothermia-related fatalities. Future research should focus on refining diagnostic criteria and exploring additional molecular markers for enhanced accuracy in forensic pathology.

Keywords: hypothermia; primary hypothermia; secondary hypothermia; alcohol; benzodiazepines; forensic pathology; immunohistochemistry.

SUICIDE BY ELECTROCUSSION: A CASE REPORT WITH UNCOMMON SKIN LESIONS

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Introduction: Death by means of electrocution occurs mainly in accidental context, making suicidal electrocutions relatively rare events. Considering its unusualness, along with the scarcity of scientific publications on this matter, its true incidence in Portugal is not accurately known. Furthermore, the diagnosis of electrocution, from a forensic perspective, is often one of exclusion, due to the frequent lack of characteristic morphological features, particularly when these deaths occur in a bathtub filled with liquid.

Case report: A fifty-three-year-old woman, with previous history of a suicide attempt and subsequent admission in a psychiatric hospital, was found dead at home inside an empty bathtub, with a hairdryer by her side plugged into a wall outlet. Several suicide notes were found in the victim's apartment. External examination showed an overall wet body surface, presenting an "L" shaped lesion on the lateral surface of the right thigh, measuring 15,5x13 cm, exhibiting a whitish halo and areas of epidermal detachment, consistent with a contact burn from a hairdryer. An irregular desiccated lesion was noted on the posterior neck. The victim also presented multiple superficial and parallel incised cuts on the anterior aspect of both wrists. The remaining autopsy was unremarkable. Histologically, the thigh lesion showed subepidermal separation and oedema of the dermis, while the neck lesion revealed epidermal denudation and apparent cauterization of the dermis.Toxicologic analysis showed non-lethal concentrations of antidepressants and benzodiazepines.Considering all circumstantial information and autopsy findings, death was attributed to electrocution, with probable entry point of the electric current through the right thigh, and probable exit point at the neck.

Conclusions: Electricity related suicides are a rare occurrence and often present as a forensic challenge, particularly in deaths taken place in bathtubs - the low electrical resistance caused by the water leads to cutaneous lesions being uncommon, making this investigation more challenging. However, in the presented case, several findings suggested a suicidal death caused by electrocution: *i)* the "L" shaped thigh lesion showed features suggestive of direct thermal action of the hairdryer, while also presenting "classical" histological thermoelectrical features (probable entry point); *ii)* the neck lesion showed alterations compatible with a thermal injury (interpreted as probable direct contact with a metallic piece of the bathtub, acting as an exit point); *iii)* history of previous suicide attempt; *iv)* multiple cuts found on both wrists; v) and the suicide notes found at the death scene.

Keywords: electrocution; suicide; forensic; skin.

A GIANT OVARIAN CYST - AUTOPSY CASE REPORT

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Introduction: Ovarian cysts larger than 10 cm in diameter are rare and are known as giant ovarian cysts (GOC). Usually, they are early diagnosed and surgically removed, but in some cases, they may reach enormous sizes. Gynecological diseases unrelated to pregnancy rarely cause sudden death, and there are not many forensic cases associated with this topic
Case presentation: A 59-year-old woman in a stage of putrefaction was found in her apartment. Her abdomen was highly distended. The autopsy revealed GOC about the size of a large watermelon, which occupied most of the abdominal cavity, pushing abdominal organs to the periphery and diaphragm and chest organs upwards. The GOC was filed with 48 liters of dirty-reddish fluid. Further examination revealed that the cyst originated from the left ovary which was entirely replaced by numerous smaller and larger irregularly arranged honeycomb-like cystic cavities. Except putrefaction, no injuries or other abnormalities were found.
Discussion: Ovarian cysts found in autopsies are usually small in size. Around 62.7% of detected ovarian cysts are smaller than 20 mm in diameter, and only 7.8% of the ovarian cysts exceed the size over 50 mm. GOC are rarely associated with a fatal outcome. Complications of the cyst, such as spontaneous bleeding, torsion, infection, and rupture, are all considered life-threatening conditions. Malignant alteration, or disorders associated with increased intraabdominal pressure and compression of the abdominal and thoracic organs, may also be lethal. Increased intraabdominal-pressure causes the elevation of the diaphragm, thus reducing the volume and mobility of the chest, compromising the function of the respiratory and cardiovascular systems, and restrictive lung and heart insufficiency in long-term may develop The assumed pathophysiological mechanism behind the deadly outcome in the presented case was probably multifactorial. The long-term increased intra-abdominal pressure and consequential compression of the abdominal and thoracic organs, respiratory disorder, chronic heart failure, cerebral hypoxia, or complications of the cyst itself could all be the cause of death.
Conclusion: In the presented case, due to advanced putrefactive changes, we were unable to determine the exact cause of death. The absence of external and internal injuries, a negative toxicological analyzes, and the absence of the chronic diseases of significance, all suggest that the cause of death in this woman, is most likely related to the presence of a GOC and its effects on the respiratory, cardiovascular and other organ systems.

Keywords: ovarian cyst; giant ovarian cyst; autopsy; death mechanism; cause of death.

AN UNUSUAL CASE OF A DELAYED DEATH AFTER SUICIDAL INTRAORAL GUNSHOT

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Introduction: Penetrating craniocerebral injuries (PCI) caused by firearms have high mortality rate which exceeds 90%. They are common in everyday forensic practice and account for around 12% of all craniocerebral injuries. Here we report a case of a man who outlived PCI.
Case report: A 65-year-old man attempted suicide by using a revolver (Smith & Wesson .357) to shoot himself in the mouth. Immediately after being injured he was completely conscious and went to the Emergency Room accompanied by his wife. After an hour he lost consciousness and was admitted. CT scan showed multiple fractures of the right sphenoid sinus and the presence of a metal foreign body in the brain. After six days he died. The autopsy showed a surgically treated wound of the hard palate and a malignant penis tumor, which was the motive for the suicide. A minor laceration was found in the area of the mammillary bodies. The trajectory passed through the hypothalamus to the right lateral ventricle where the projectile was found. The brain was slightly edematous, without contusions. Thrombotic masses were found in the pulmonary lobar branches and the deep veins of the legs. Signs of bronchopneumonia were present. Pulmonary thromboembolism was declared as the immediate cause of death.
Discussion: More than 70% of those with PCI caused by firearms die at the scene or during transportation. Prognosis is directly correlated to the type of the weapon used, projectile velocity and localization of the injuries. Since the weapon used produces high velocity of the projectiles, the assumption is that the bullet was somehow flawed. This could explain the absence of greater damage to the brain tissue. The injuries are usually complicated by cerebral edema and increased intracranial pressure, which is the leading cause of death in the delayed period. In a small number of cases, death can be caused by distant complications associated with a long period of immobilization, such as deep vein thrombosis, hypostatic pneumonia, urinary infections and others, which is the case here. Due to the long period of immobilization and possibly the presence of the malignant tumor, deep vein thrombosis occurred, and in the end, six days after the injury, caused fatal pulmonary thromboembolism.
Conclusion: Although rare, survival of PCI caused by firearms does occur. In the presented case, the cause for the death delay was the small velocity and consequently the low kinetic energy transferred to the brain tissue.

Keywords: craniocerebral trauma; firearms; pulmonary thromboembolism; complications; autopsy.

SUDDEN CARDIAC DEATHS IN TRAFFIC ACCIDENTS – SERIES OF CASES

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Performing forensic autopsies on bodies from traffic accidents is necessary to determine the nature of death and to establish a relationship between any present injuries and the resulting fatal outcome.
We represent a series of three cases of sudden cardiac death while driving a motor vehicle. The first case involves a male, 60 years old, who lost control of his motor vehicle while driving, went off the road and collided with a traffic light. The emergency medical team attempted resuscitation at the scene, but without success.
The second case is a male, 82 years old, who lost control of his motor vehicle while driving, went off the road, and made contact with the fence of a driving school training ground. His wife was seated in the front passenger seat. The emergency medical personnel provided assistance on the spot, but the attempt was unsuccessful.
The third case involves a female, 52 years old, who lost control of her motor vehicle while driving and drove off a bridge into the Nišava River. The emergency medical team that arrived at the scene unsuccessfully attempted resuscitation.
In the presented cases, the cause of death was of natural origin and occurred as a result of a sudden deterioration of long-standing and severe heart disease and arterial vascular conditions. In the first case, involving the 60-year-old male, no mechanical injuries were found on the body. In the remaining two cases, mechanical injuries caused by blunt force trauma were identified, but these were not relevant to the fatal outcome. In all three cases, toxicological and chemical analyses of bodily fluids (blood, urine, and vitreous humor) showed no presence of ethyl alcohol.
Performing a forensic autopsy in the presented cases ruled out the existence of a violent death and excluded connection between the resulting traffic accidents and the fatal outcome. These autopsies are essential for guiding investigative and judicial authorities in further procedures and for potentially eliminating criminal liability of individuals involved in the traffic incidents.

Keywords: forensic autopsies; sudden cardiac death; heart disease; traffic accidents.

GALLSTONE ILEUS: A CASE REPORT OF A RARE CAUSE OF MECHANICAL BOWEL OBSTRUCTION

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Introduction: Among the possible complications of cholelithiasis, gallstone ileus is one of the rarer but more serious ones. It is responsible for a minority of mechanical bowel obstructions (1-4%), with higher incidence among female older patients. It happens when a gallstone enters the gastrointestinal tract, commonly due to a cholecystoduodenal fistula. With its array of non-specific symptoms such as abdominal pain and distension, nausea and vomiting, diagnosis often comes late and subsequently associated with a higher morbidity and mortality.
Case Report: A 75-year-old woman with a known history of hypertension and osteoporosis presented to her family doctor with complaints of vomiting and heartburn for 2 days. She was apyretic, and epigastric pain was noted without signs of peritoneal irritation. The patient did not wish to visit an emergency service and was discharged home with a prescription for symptomatic medication. Two days later, she was found dead at home. External examination showed signs of dehydration. Internally, the abdominal cavity showed marked distension of the stomach, containing 1.5 litres of brownish-yellow fluid; the gallbladder was collapsed, with marked thickening of its wall, adherent to the duodenum, liver, and adjacent soft tissues. At the level of the Treitz angle, a hard, mobile mass was palpated. Upon opening we observed: *i)* a rounded ulcerated area on the posterior wall of the proximal third of the duodenum, with a fistulous tract leading to the gallbladder; *ii)* presence of an ovoid calculus with blackish coloration, measuring 5x3.5x3.5 cm, compatible with a biliary calculus, contained in the duodenal lumen. Toxicological examination was negative for ethanol and drugs, and the histopathological study revealed acute necrosuppurative and abscessed cholecystitis, on a background of chronic cholecystitis. Considering all the available elements, the cause of death was determined to be acute necrosuppurative and abscessed cholecystitis complicated by mechanical intestinal obstruction due to gallstone ileus.
Conclusions: Gallstone ileus accounts for 1%-4% of all bowel obstructions, more commonly in elderly female patients. Its vague presentation makes it a challenging diagnosis associated with a high mortality. Before autopsy, it is important to carefully assess the victim's clinical history, with particular attention to long-standing history of cholelithiasis or recurrent episodes of acute cholecystitis. It may also be crucial to review biliary and gastrointestinal anatomy to better enable the medical examiner to assess the case and adapt the dissection technique to assure that these rare pathologies do not go unnoticed.

Keywords: gallstone ileus; bowel obstruction; forensic; autopsy.

FORENSIC CASE REPORT: SUSPECTED ELECTROCUTION SUICIDE

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This report details a rare case of suicidal electrocution involving the intentional immersion of the head into a water-filled bucket containing a submerged electrical appliance. The deceased, an elderly male, was discovered in a wooden garden shed equipped with an underground storage compartment. Scene investigation revealed a plastic bucket filled with water and an electrical hairdryer plugged into an active power source. There were no signs of third-party involvement or struggle, and the setup appeared intentional and deliberate. Postmortem examination revealed characteristic electrical injuries, including a well-defined entry burn on the left wrist and severe arc burns on the right ear. The scalp and facial region displayed patchy thermal lesions, and a metallic upper dental prosthesis was noted. Importantly, a corresponding thermal burn was identified on the hard palate, consistent with intraoral conduction of electrical current via the prosthesis. Additional findings included conjunctival hemorrhage, thermal corneal injury, and pulmonary edema, all suggestive of electrocution in a wet environment. Internal examination did not reveal any natural cause of death or significant trauma. Histological samples were taken to evaluate for microscopic evidence of electrocution. The configuration of the scene, nature of the injuries, and absence of alternative explanations led to the determination that the cause of death was electrocution, and the manner of death was suicide. This case illustrates the complexity of forensic evaluation in electrocution-related deaths, particularly when internal conductive factors such as metallic prostheses are involved. It also highlights the need for thorough scene documentation and comprehensive autopsy, including both external and internal assessments, to establish the electropathological mechanism of death.

Keywords: electrocution; suicide; forensic pathology; metallic denture; electrical burn.

INVASIVE NECROTISING PULMONARY ASPERGILIOSIS

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Objective. To present a case of invasive pulmonary aspergillosis caused by Aspergillus niger.
Introduction. Invasive pulmonary aspergillosis (IPA) is a rare but serious fungal infection that typically develops in the presence of certain predisposing factors: previous respiratory tract infections, chronic, obstructive or structural lung diseases. The most common causative agent of IPA is Aspergillus fumigatus, which forms greenish-gray colonies. Recently, it has been observed that IPA can also occur as a complication of severe influenza and COVID-19 in individuals without established chronic lung diseases.
Case description. A 52-year-old man was found deceased at home. There was no known history of chronic immunocompromising conditions or respiratory diseases. The body was cachectic on external examination. Internal examination revealed black, mucous fluid in the lumens of the trachea and major bronchi, with a hyperemic mucosal surface. The lungs were soft and elastic on palpation. Sectioning of the lungs revealed multiple cavities with blackened edges, and the lung parenchyma appeared unstructured. Histological examination showed alveolar swelling in some areas, pigmented macrophages, and accumulations of free black pigment. Wide zones of ischemic necrosis (infarctions) with cavity formation were observed. Fungal hyphae exhibiting dichotomous branching were scattered within the necrotic areas, pigment deposits, and thrombi occluding some vascular lumens. Fungal invasion of blood vessel walls and associated thrombi was noted. The walls of the cavities contained black melanized pigment and oxalic acid crystals, which demonstrated birefringence under polarized light.
Discussion. Pulmonary aspergillosis caused by Aspergillus niger is rare. A classic histopathological sign of A. niger infection is the presence of calcium oxalate crystals in biopsy specimens, even in the absence of fungal spores (conidia). The morphology of A. niger, characterized by the formation of black colonies, distinguishes it from other Aspergillus species. The deposition of calcium oxalate crystals in the lung tissue is thought to contribute to progressive pulmonary dysfunction. In this case, the cause of death was determined to be invasive necrotizing pulmonary aspergillosis, complicated by subacute cardiac and respiratory failure.
Conclusions. Aspergillosis caused by A. niger is rare. Diagnosis is based on macroscopic findings, such as pulmonary cavitation, and histopathological evidence, including the presence of calcium oxalate crystals and black pigmented fungal colonies.

Keywords: Aspergillus niger; invasive pulmonary aspergillosis; autopsy.

FATAL SELF-INFLICTED THORACIC BLAST INJURY USING A MODIFIED MOLE TRAP: A CASE REPORT

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Explosive suicides involving improvised devices are extremely rare and pose unique challenges for forensic investigation. We present a detailed case report of a fatal self-inflicted thoracic blast injury caused by a mechanical mole trap (vol-trap) functioning as a crude explosive device. The decedent, an adult male, was discovered at home with a single, focused blast wound on the anterior chest, consistent with close-contact detonation. The device was found adjacent to the body and had been used in its original form to discharge percussion or blank ammunition through mechanical activation. Autopsy findings revealed massive trauma to the thoracic region, including comminuted rib fractures, a 3 cm laceration of the left ventricle, pericardial rupture, and extensive hemothorax. The heart and left lung showed signs of severe blast injury, while the right lung remained unaffected. Radiographic imaging confirmed internal structural damage and the presence of metallic fragments. No additional injuries were observed, and toxicology results were pending at the time of reporting. The unique nature of the device and absence of hesitation wounds, defensive injuries, or signs of struggle strongly supported a manner of death classified as suicide. The act occurred while the decedent's wife was in the next room, further corroborating the self-inflicted nature of the event. This case underscores the lethal potential of unconventional mechanical devices and the importance of thorough forensic evaluation in atypical injury presentations. From a scientific standpoint, this case provides valuable insight into the biomechanics of blast trauma at close range and emphasizes the need for forensic awareness of unconventional suicide methods. It also highlights the role of detailed scene investigation, imaging, and comprehensive autopsy in establishing the cause and manner of death in unusual forensic contexts.

Keywords: blast injury; suicide; mechanical device; forensic pathology; cardiac trauma.

FATAL FALLS OVER A FIVE-YEAR PERIOD IN SZEGED, HUNGARY

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Falls are frequent and major problems in the elderly. Our study investigates the characteristics of fatal falls from the same level, stairs or furniture over a five-year period.
We retrospectively analyzed 284 falls, which were autopsied at the Department of Forensic and Legal Medicine, University of Szeged, Hungary between 2019 and 2023. In this work we focus on 104 official autopsies ordered by the police. These cases were analysed toward socio-demographic characteristics, fall circumstances, injury pattern, comorbidities, medication taken, alcohol use and cause of death.
Our results show that 56% of falls occurred in the patient's home and 16% in a nursing home. The sex ratio was almost equal. 70% of fatal falls were falls at the same level, while 10% were falls from stairs. The most severely injured body part in all fall mechanisms was the head. The role of alcohol consumption, diseases contributing to falls and the role of medications taken were also examined.
Our study suggests that efforts should be made to make the patient's home environment safer.

Keywords: fatal falls; ground level fall; elderly.

SUDDEN CARDIAC DEATH IN A 5-MONTH-OLD INFANT DUE TO ENDOCARDIAL FIBROELASTOSIS AND DILATED CARDIOMYOPATHY - CASE REPORT

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Endocardial fibroelastosis (EFE) is a pathological process characterized by abnormal deposition of collagen and elastin within the endocardium, affecting the left ventricle. This deposition leads to progressive left ventricular dysfunction. EFE typically presents within the first month of life and often manifests as dilated cardiomyopathy in neonates. In some cases, sudden cardiac death may be the initial manifestation of the disease.
We report the case of a 5-month-old infant with no previously detected health issues. The child was born at full term, weighing 3,800 grams, as the first child from a healthy and regularly followed-up pregnancy. The onset of symptoms started a few hours prior to hospital admission. On clinical examination, the infant exhibited tachypnea, pale skin, oral cyanosis, cold extremities, and tachycardia. The patient appeared adynamic and hypotonic.
Echocardiography revealed a markedly dilated left ventricle, tricuspid regurgitation, severely reduced myocardial contractility, low ejection fraction, and signs of acute heart failure. Laboratory analysis showed markedly elevated levels of troponin I and B-type natriuretic peptide (BNP). Due to rapid worsening of symptoms and per acute clinical deterioration, the patient was intubated and inotropic support was initiated. Despite intensive management, the infant died within four hours of hospital admission.
Forensic autopsy findings included severe cardiomegaly, endocardial fibroelastosis, and pulmonary edema. Histopathological examination revealed acute myocardial ischemia, myocardial scarring consistent with previous ischemic episodes, vacuolar degeneration of myocardial cells, and extensive myocardial fibrosis.
Endocardial fibroelastosis remains a condition with poor prognosis. Therefore, early antenatal and postnatal detection is crucial. A multidisciplinary approach involving gynecology, pediatric cardiology, neonatology, and pathology is essential for timely diagnosis and management. Prompt treatment—including early consideration of cardiac transplantation, pharmacotherapy, and long-term follow-up—may improve outcomes and reduce the risk of fatal complications such as sudden cardiac death.

Keywords: endocardial fibroelastosis; dilated cardiomyopathy; sudden cardiac death; forensic autopsy.

EXAMINATION AND EXPERTISE OF SEXUAL ASSAULT VICTIMS AT THE INSTITUTE OF FORENSIC MEDICINE IN NIŠ, SERBIA - CASE REPORT

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In the current Criminal Code of the Republic of Serbia, sexual life is addressed within the framework of criminal offenses against sexual freedom, encompassing any sexual act performed by force and against the will of the victim. In cases of suspected offenses against sexual freedom, the Institute of Forensic Medicine in Niš performs the following procedures:
Clinical forensic examination of the entire body, with a detailed description of observed injuries; Gynecological forensic examination, focused on the genito-anal region; Laboratory analyses including: Swabs (vulvar, vaginal, endocervical, buccal, anal, bite sites, etc.); Collection of subungual material (cutting/scraping); Microscopic examination (native and stained slides for detection of spermatozoa or sperm components); Prostate-Specific Antigen testing (Seratec PSA); Rapid Stain Identification of Human Semen (RSID™-Semen); DNA analysis; Microbiological examination; Blood and urine collection for toxicological screening; Pubic hair collection; Preservation and examination of clothing and personal items.
Case Report:
A 25-year-old female reported being physically and sexually assaulted in the elevator of a residential building by a 32-year-old male unknown to her. During the incident, the suspect allegedly used physical force, resulting in multiple bodily injuries to the victim, and compelled her to engage in non-consensual oral-genital contact (fellatio). The victim stated that no vaginal penetration occurred. The victim was brought to the Institute for examination shortly after the alleged incident. Prior to the physical and gynecological examinations, biological material was collected for forensic laboratory analysis. Several hours after the event, the suspect was apprehended and brought to the Institute under police escort. Upon arrival, biological samples were obtained, followed by a clinical forensic examination.
Clinical forensic examination of the victim revealed multiple contusions, hematomas, and superficial abrasions on various parts of the body. Forensic biological analyses confirmed the presence of the suspect's DNA on specific areas of the victim's body (skin and fingernails of the right hand, and subungual material of the left hand). Additionally, the victim's DNA was identified on several areas of the suspect's body (fingers, fingernails, subungual material, scrotal skin, pubic region), as well as on a hair retrieved from the suspect's underwear and on tissues recovered from his clothing.
The results of the forensic analyses unequivocally confirm close and direct physical contact between the victim and the suspect, thereby confirming their spatial and temporal association.

Keywords: sexual assault victims; sexual abuse; clinical forensic examination; forensic genetics.

THE ROLE AND SIGNIFICANCE OF CLINICAL-FORENSIC EXAMINATIONS OF MINORS IN JUDICIAL PROCEEDINGS - A CASE REPORT

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The clinical-forensic examination of living individuals entails the application of forensic medical principles in the analysis, diagnosis, and documentation of bodily injuries, physiological alterations, and diverse medical conditions. This specialized domain, known as clinical forensic medicine, represents a subfield of forensic medicine that bridges clinical practice with legal requirements. Forensic medical examination entails a mandatory clinical examination of both victims and perpetrators of this criminal act (physical examination, specimen collection, proper marking and preservation of evidence and biological material, adequate documentation, and preferably, photography). Through a comprehensive and methodologically rigorous approach, such examinations play a critical role in supporting judicial and law enforcement procedures, ensuring accurate medico-legal evaluations essential to the administration of justice.

We represent the case that involves an incident between two minors, both under the age of 14, in which one of the individuals sustained fatal injuries. Immediately following the critical event, a clinical-forensic examination was conducted on the child suspected of committing the act. The examination on the child revealed the presence of multiple recent injuries on the head and body, and numerous scar-like skin changes, with the skin appearing as a wiped pattern, pearly-white in color. This specific approach in the examination was of crucial importance to the entire judicial process, as it facilitated the determination of key forensic medical conclusions. Firstly, it was established that the examined individual was not a victim of a knife attack, but rather that all the recent injuries sustained were inflicted by a blunt force trauma. Furthermore, it was determined that the scar tissue identified on the individual could have been the result of self-inflicted harm. These findings were significant for the work of the judicial authorities, as they played a pivotal role in the subsequent proceedings against the parents of the minor, who were accused of neglecting their child and failing to timely involve appropriate institutional support.

Fundamental principles of forensic medical diagnostics and the accurate description of injuries and pathological changes during forensic clinical examinations as part of forensic medical expert evaluations, it can be concluded that the significance of clinical forensic medicine is multifaceted and encompasses various critical aspects including - guidance of the police investigation and establishment and assessment of other conditions that are relevant to the judicial practice.

Keyword: clinical forensic medicine; clinical forensic examination; minor; neglect.

CASE REPORTS OF MEDICAL MALPRAXIS DURING INTUBATION

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We present you two case reports in which a medical error occurred during intubation in the process of introducing the patients into general anesthesia. The autopsies were performed at the Institute of Forensic Medicine in Skopje, N. Macedonia. In the first case, it concerns the introduction of a woman in labor into general anesthesia in order to terminate her pregnancy with an elective Caesarean section. The woman in labor is 33 years old, a first-time mother, with a normal pregnancy, who due to fear of vaginal delivery, insisted on giving birth by elective Caesarean section. During her intubation, there was a sudden drop in her vital parameters with consecutive cardiac arrest. After resuscitation was unsuccessful, the baby removed by Caesarean section was alive, but with severe hypoxic brain damage. An autopsy was performed and it determined incorrect intubation, in which the tube was initially inserted into the esophagus, instead of the trachea, causing esophageal mucosal lesion, bloating with air along the entire gastrointestinal tract and non-specific signs of asphyxia were also found. In the second case, a 70-year-old woman was admitted for an eye surgery - vitrectomy under general anesthesia. During the intubation, her trachea had been ruptured with the tube, which had caused pneumothorax. Even thought the tracheal tear was surgically repaired, the patient died 6 days later. An autopsy revealed a 9cm longitudinal tear of the trachea which has caused brain death. Medicolegal examination of an interventions as endotracheal intubation is very valuable to physicians. Our objectives were to comprehensively detail the factors raised in litigation to better educate physicians on strategies for minimizing liability and augmenting patient safety.

Keywords: malpractice, anesthesia, intubation, negligence, forensic autopsy.

FATAL HYPOTHERMIA CASES IN SZEGED, HUNGARY BETWEEN 2014-2023

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We retrospectively examined the autopsy cases performed at our Institute between 20214-2023 that were directly causally related to cold exposure. We reviewed the police report, external examination and autopsy findings, histological and toxicological finding of 46 hypothermia deaths. Our results showed that the majority of the victims were male, had been exposed to cold in open spaces, and a quarter of the victims were under the influence of alcohol. Furthermore we review the complementary investigations (histology, biochemistry) that can confirm hypothermia in the absence of definitive autopsy findings.

Keywords: autopsy; hypothermia; forensic.

UNMASKING THE DANGER OF FALSE MOREL: A FATAL CASE OF GYROMITRIN POISONING

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Introduction: Gyromitrin is a clinically important mycotoxin found in the mushroom Gyromitra esculenta. Gyromitra esculenta (false morel) is most often mistaken for the non-poisonous Morchella esculenta (true morel) due to their similar appearance. Ingestion can cause symptoms of gastroenteritis, liver toxicity, and may lead to severe neurotoxicity—including seizures—due to its toxic metabolite, monomethylhydrazine; in some cases, it can also result in methemoglobinemia. Methemoglobinemia occurs when hemoglobin is oxidized to methemoglobin (MetHb), which cannot carry oxygen. This condition involves the oxidation of iron in hemoglobin from the ferrous (Fe^{2+}) to the ferric (Fe^{3+}) state, impairing oxygen transport and shifting the oxygen dissociation curve to the left, ultimately reducing oxygen delivery and increasing the risk of tissue hypoxia. At methemoglobin levels above 70%, the risk of death is high due to severely impaired oxygen delivery to tissues.

Presentation of case: We present the case of a deceased individual who, according to witness statements, consumed raw mushrooms purchased abroad one day prior to death, after which he experienced severe gastrointestinal symptoms and died the following day aboard a sailboat. According to police reports, three individuals consumed the mushrooms in question. Two of them developed vomiting, whereas the deceased had taken antiemetic medication and did not experience any episodes of vomiting. The body was sent for autopsy, which revealed cyanosis of the extremities and edema of the lungs and brain upon external and internal examination. The stomach contained more than two liters of mostly dark-colored liquid content. Histological examination of the liver samples revealed intrahepatic cholestasis and signs of ballooning degeneration. Samples of hair, liver, kidneys, gastric wall, blood, urine, as well as bile and gastric contents were collected for toxicological analysis. Toxicological screening did not detect the presence of any medications, narcotics, or other known addictive substances. Additionally, blood and urine samples revealed 0.00 g/kg of absolute alcohol. Spectrometric analysis revealed 45% methemoglobin in the blood. The police subsequently submitted dried mushrooms, milk, and medications reportedly consumed by the deceased. The mushrooms closely resembled true morels in appearance, which likely contributed to their misidentification and subsequent consumption. These samples were sent to the Clinical Department of Forensic Medicine, KBC Split. Following extraction with organic solvents and analysis by gas chromatography–mass spectrometry (GC-MS), no toxic substances were detected in any of the non-biological samples. Although toxicological analysis did not detect the presence of toxic substances, based on the quantity of mushrooms submitted for analysis, the morphological similarity between Morchella esculenta and Gyromitra esculenta, the documented presence of methemoglobinemia, as well as the available data and autopsy findings, it was indirectly concluded that the cause of death was a violent death due to foodborne intoxication, most likely induced by gyromitrin.

Conclusion: In conclusion, this case highlights the potentially fatal consequences of gyromitrin poisoning, particularly when associated with the consumption of raw Gyromitra esculenta. The presence of elevated methemoglobin levels, along with autopsy and toxicological findings, supports the diagnosis of severe food poisoning leading to death due to impaired oxygen delivery and multi-organ effects.

DEADLY SEAT BELT: CASE REPORT

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While road traffic accidents remain a significant public health problem, the appropriate use of seat belts is one of the most effective strategies to improve road safety. However, the seat belt itself can contribute to various injuries.
The most common injuries from seat belts are abrasions and bruising along the diagonal or transverse part of the belt ("seat belt sign"). These may also be accompanied by lacerations of the small and large intestines and injuries to the lumbar spine ("seat belt syndrome"). More common injuries also include rib, sternum, or collarbone fractures, bladder lacerations, and abdominal aortic injuries.
The seat belt is rarely the only cause of mortality for passengers in a car. However, there were forensic autopsies performed on two female passengers whose seat belts acted like a blade, causing severe injuries to the neck and chest, which was the direct cause of death. According to the police, both seat belts were technically sound, and considering the injuries witnessed, the two occupants were adequately restrained. Two deceased women in their sixties were rear-seat occupants of a BMW 218i Active Tourer that collided head-on with a light van on a regional route.
The occupants sustained similar, mirror-image injuries, reflecting the seat belt position of both occupants. The following injuries were identified: a major laceration-incision wound to the neck and chest with sternum fracture and open rib fractures, fractures of the lateral processes of the cervical and thoracic vertebrae, contusions of the heart and lungs, and deep liver lacerations. The occupant sitting on the left also suffered a laceration of the thoracic aorta, pericardium, and right atrial wall, while the occupant on the right suffered a fracture of the left clavicle. The occupant on the right had the transverse part of the seat belt positioned higher than the other occupant, leading to significant transverse abdominal wall lacerations, intestinal wall lacerations, and contusions of the intestine, liver, pancreas, and bladder wall. However, the occupant on the left, where the seat belt position was more appropriate, sustained a comminuted fracture of the left iliac wing.
The unusual extent of the injuries can solely be attributed to the substantial force applied during the impact, which was conveyed to the bodies of the deceased individuals exclusively via the limited surface area of the seat belt and their specific positioning at the time of impact (with the belt positioned along the lower edge of their necks).

Keywords: seat belt injury; road traffic accident; rear-seat occupant.

TRAUMATIC PARTIAL DECAPITATION IN SUICIDAL HANGING

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Introduction: Suicidal strangulation by ligature is among the most frequent methods of suicide worldwide. However, complete or partial decapitation is an extremely rare outcome, occurring only under specific biomechanical conditions, contributing to vitality reactions widely associated with hanging, such as hemorrhaging beneath the anterior longitudinal spinal ligaments (Simon's sign) and transversal lacerations of the intimal layer of the carotid arteries (Amussat's sign). This report examines a case of traumatic partial decapitation with vitality reactions following hanging.
Case description: 47-year-old male was found hanging from a tree with a metal cable noose, his head partially severed from the torso. Blood covered the clothing and limbs, pooling beneath. External examination revealed a parchment-like ligature on the left dorsal neck surface and a 32 cm wound with clean margins on the anterior surface of the neck. Internal examination showed anterior neck tissue and vasculature detachment, lingual, tracheal and esophageal avulsion, fractures of the right horn of the hyoid bone and superior horns of the cricoid cartilage with scarce tissue remnants posteriorly keeping head and body intact. Amussat's sign was present in the common carotid arteries. The spine was transversely fractured at the C1-C2 level, with part of the axial arch and dens remaining attached to the atlas. Spinal cord was completely transected with diffuse bruising at the site of fracture. Simon's sign was clearly visible at Th12-S1 level. The cause of death – traumatic partial decapitation.
Discussion: Decapitation as a consequence of hanging occurs scarcely, with only a handful of cases recorded in literature. Researchers identify specific biomechanical factors contributing to decapitation, including drop distance, body mass, high kinetic energy, noose-neck contact area and ligature elasticity, collectively resulting in a sudden body tug within a fixed noose, leading to complete suspension. Decapitation demands a rigid ligature, such as metal cable, since its inflexible structure minimizes energy dispersion, ensuring stronger neck compression and greater force application. Simultaneously it creates shearing stress on the intimal layer of the carotid arteries, resulting in transversal lacerations – vitality indicator named Amussat's sign. Identical situational circumstances cause spinal hyperextension and mechanical strain generating shearing forces on the intervertebral discs triggering bleeding underneath the anterior longitudinal ligaments – vitality reaction known as Simon's hemorrhages.
Conclusions: For decapitation to occur, a rigid ligature and specific situational circumstances are essential and might also trigger vitality reactions. In hanging investigations, the presence of such conditions necessitates thorough evaluation of vitality indicators.

Keywords: decapitation; hanging; vitality reactions; Simon's sign; Amussat's sign.

FATAL INJURIES CAUSED BY CAPTIVE BOLT DEVICES

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In Hungary, firearm use is the fourth most common method of committing suicide, after hanging, jumping from heights and poisoning. Based on autopsy data of our Institute in 2015-2024, there were 44 deaths caused by firearms or captive bolt guns recorded. In 33 cases, the fatal injury was caused by a conventional firearm. In 11 cases, the instruments were captive bolt devices, which are used in slaughterhouses and households. We present a combined case report focusing on the characteristic features of injuries caused by captive bolt guns. Although those are not classified as firearms by their mechanism of operation, they are classified as shooting devices, however the injuries they cause are more typical of stab wounds. Our cases were retrospectively demographically analysed, examined the characteristics of the injuries that caused death, the involvement of body sites, the length of survival and the immediate cause of death. The victims were all male, 10 of the cases were self-inflicted, 1 was a homicidal shot. 10 cases involved damage to the skull, in these cases, brain contusions were the immediate cause of death.

Keywords: autopsy; captive-bolt device; fatal; suicide; stab wound.

FORENSIC CASE REPORT: SUICIDE BY IMPROVISED FIREARM WITH MODIFIED LIVESTOCK CARTRIDGE

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Background: Firearm-related suicides are among the most lethal methods of self-harm. In countries with restricted access to conventional firearms, individuals may resort to improvised devices and modified ammunition to carry out their intent. This case presents an unusual suicide involving a homemade firearm and modified livestock-stunning cartridges.
Case Presentation: A deceased adult male was found with a single gunshot wound to the anterior chest. A crude but functional improvised firearm was recovered at the scene, constructed from metal piping and mechanical fittings. The weapon was capable of discharging modified 9×17 mm livestock cartridges (RWS Viehbetäubung), which had steel ball bearings manually inserted into the crimped end, effectively turning blank rounds into lethal projectiles. External examination revealed a contact-range entry wound to the left anterior thorax, with soot deposition and a stellate laceration pattern. An exit wound was observed on the left posterolateral thorax. Notably, a circular impact mark with blood spatter was identified on the tile floor beneath the body, directly below the exit wound. Despite the apparent through and through trajectory, a steel ball projectile was recovered inside the thoracic cavity at autopsy. This indicates the projectile exited the body, struck the floor, and re-entered the thorax. A rare but documented phenomenon in forensic ballistics.
Conclusion: This case highlights the lethality of improvised firearms and repurposed industrial cartridges. It also emphasizes the importance of careful scene analysis and autopsy correlation in identifying atypical projectile behavior, such as ricochet and re-entry, which could otherwise be misinterpreted as multiple gunshot wounds. Forensic awareness of such scenarios is essential in both suicide investigations and potential criminal case differentiation.

Keywords: improvised firearm, modified ammunition; suicide; ricochet re-entry; forensic ballistics

APPLICATION OF LIQUID CHROMATOGRAPHY WITH TANDEM MASS DETECTION (UPLC-MS/MS) IN THE CONFIRMATION OF GHB ABUSE FOR PURPOSE OF CRIMINOGENIC POISONING

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Introduction: Gamma-hydrobutyrate (GHB) is a restricted drug, and in most countries around the world it is included in the list of prohibited substances. It is illegal in the European Union and has no medical use. GHB is known as a rape drug, due to its ability to induce sedation, confusion and loss of consciousness, which easily incapacitates the victim. One of the characteristics of this substance is that it causes short-term retrograde amnesia. On the illegal market, it is usually found in the form of a colorless and odorless, almost tasteless liquid that can easily be added to drinks. In combination with alcohol, the effects of GHB are more pronounced, which increases the risk for overdose. GHB has a short half-life, and it is often difficult to detect it in biological material. In the majority of cases, the interval between GHB administration and cosumption and the onset of risk awareness as the victim becomes conscious, surpasses its biological half-life. Also, the presence of endogenous GHB complicates the interpretation of results obtained through the analysis of biological samples.
Objective: The objective of this publication is to present a case of GHB abuse for criminogenic purposes and the possibilities of analytical confirmation of GHB by liquid chromatography with tandem mass detection (UPLC-MS/MS).
Case-report: A 22-year-old unconscious woman was brought to the National Poison Control Center Serbia. It was reported that she had been at a nightclub the evening before her admission. For further observation, diagnostic and screening procedures were performed. The immunochromatographic test for the most commonly used psychoactive substances was negative. A clinical diagnosis of GHB poisoning was established due to the sudden awakening from a coma after the administration of infusion solutions. In further anamnesis, there was data that indicated a sexual assault, after she lost consciousness in a night club. In order to confirm the presence of GHB in biological samples, UPLC-MS/MS method was applied. Presence of GHB in a concentration of 32 mg/L was confirmed in the urine sample, while presence of GHB in a concentration higher than endogenous was not detected in the blood sample.
Conclusion: GHB poisonings are not common, but they can have severe clinical picture. Diagnosis is often challenging and the application of UPLC-MS/MS method in urine analysis makes detection easier.

Keywords: GHB; coma; diagnosis; urine; UPLC-MS/MS.

AUTOPSY FINDINGS IN GHB AND GBL INTOXICATION

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Gamma-hydroxybutyrate (GHB) is a recreational drug often used in the nightclub and party scene. Gamma-butyrolactone (GBL) is used in the production of herbicides, fertilizers, and pharmaceuticals, as a solvent or an additive in products such as nail polish remover and car cleaners. When consumed, GBL is hydrolyzed into GHB *in vivo*. GHB effects often include dizziness, euphoria, drowsiness, a feeling of drunkenness, confusion, and sedation with nausea and vomiting. In cases of severe intoxication, symptoms often include collapse, convulsions, bradycardia, respiratory depression, and coma, while fatal intoxications are not common. Both GHB and GBL misuse seem to be increasing, and they are becoming an important drug of abuse in forensic medicine. The literature on autopsy findings in cases of GHB or GBL intoxications seems to be scarce, with findings described as non-specific. We report several cases of fatal intoxication with GHB and GBL. The majority of the deceased were young males, and none of the cases were drug-facilitated sexual assaults, contrary to the large percentage of cases reported in the literature. In all cases, the drugs were ingested. In a large number of cases, we encountered autopsy findings rarely described in the literature concerning GHB or GBL intoxication. Since fatal GHB and GBL intoxications are not common and both drugs are not routinely screened for, we propose that our findings can raise suspicion of intoxication with GHB or GBL.

Keywords: GHB; GBL; forensic toxicology; autopsy findings; fatal Intoxication.

βAPP DETECTION OF DIFFUSE AXONAL INJURY IN CASES OF VERY SHORT SURVIVAL (< 1 HOUR)

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Diffuse axonal injury (DAI) represents axonal damage caused by acceleration-deceleration mechanical trauma, with elements of head rotation. As these forces propagate through the white matter, they shear and stretch the layers of brain tissue, causing axonal damage. The clinical manifestations of DAI include immediate and prolonged coma, often accompanied by long-term neurological sequelae or fatal outcomes. Its incidence is not well established, but it is presumed to be more frequent than diagnosed. Axonal injury is believed to be present in most severe head traumas with loss of consciousness in traffic accidents. Milder forms of axonal injury are characterized by transient clinical disturbances, closely resembling severe concussion. In cases of short survival, around two hours, immunostaining for beta-amyloid precursor protein (βAPP) is a highly sensitive method and very effective in confirming axonal injury. The aim of this study is to determine the efficiency of βAPP immunostaining in diagnosing axonal injury in cases of very short survival after craniocerebral trauma (less than one hour), as well as its expression and distribution in the observed brain tissue regions.
Method: The material for this study consisted of brain tissue from 36 adult individuals who suffered fatal injuries due to acceleration-deceleration mechanisms. Immunostaining detected βAPP positivity in the predilection regions for axonal injury, including the parasagittal frontal white matter, the genu and splenium of the corpus callosum, and the pons. The βAPP positivity in analyzed sections was registered by the presence of axonal bulbs/varicosities and semi-quantitatively assessed using the Gentleman scale. The obtained data were processed using descriptive and inferential statistical methods, with a statistical significance level of 0.05.
Results: In the total sample, βAPP immunopositivity was confirmed in 32 out of 36 cases (88.9%). Among the 14 cases with survival up to one hour, βAPP positivity was detected in 11 (78.5%). The shortest survival interval with confirmed βAPP immunopositivity was 20–25 minutes, observed in three cases. The distribution of βAPP positivity was relatively uniform across all observed brain regions, with slightly stronger expression in the brainstem (most pronounced in the pons), though without statistical significance.
Conclusion: βAPP immunostaining demonstrates efficiency in detecting axonal injury in cases of very short survival (less than one hour). The distribution and severity of axonal injury across the observed brain regions slightly increase towards posteriorly located vital brain structures, consistent with the fact that these were severe head injuries with a fatal outcome.

Keywords: craniocerebral trauma; diffuse axonal injury; amyloid beta-peptides.

HISTOLOGICAL COMPARISON OF GUNSHOTS AND STABBED INJURIES

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Background: Case 1.: 26 year old woman shot in her head twice. She got two shots in her skull with a long-barrel gun. The murderer used an improvised silencer made of socks stuffed in a PET bottle. The perpetrator committed suicide with the same weapon without using the silencer. Case 2.: 52 year old woman stabbed 49 times on her face, neck, chest, abdomen and thigh. The weapon was a hunting knife with a 12 cm long blade.
Materials and methods: We performed medico-legal autopsies in all cases. Histology was prepared from the shot injuries, brain, and solid organs. The slides were examined by microscope. Unstained sections were made and examined by phase contrast microscope.
Results: Autopsy; Case 1.: Two shot injuries could be detected on the skull of the female victim. The suicide committed by one single headshot. Apart from the shots, no other injuries were found. In case of the victim the first projectile fragmented on the skull base, only three fragments were found. The second bullet entered in the skull, and wedged in the opposite side temporal muscle, causing severe brain damage and intracranial haemorrhage. In the male skull no projectile were found, the bullet penetrated through, both sides of the skull, the brain and left the body. The cause of death in both cases were the brain damage, brain edema and the intracranial haemorrhage.
Case 2.: The cause of the death was air embolism, caused by the damage of the superficial veins of the neck.
Histology; Case 1.: There was a difference of the soot precipitation, because of the silencer. In case of the victim, a slighter precipitation was detectable. The structural distortion of the connective tissue were similar in the two case (brush-like separation of the collagen fibres, double contour collagen bands).
Case 2: There were smooth cut surfaces of the collagen fibres, and the previously detailed specific changes were absent. The femoral injuries were postmortal.
Conclusions: Comparing the injuries of the victim, and the perpetrator we can found differences in the soot precipitation because the using of the silencer in case of the victim. The structural distortion of the connective tissue was the same in the two shot wounds, bit different in the stabbed wounds. This gives us the opportunity to differentiate the gunshot wounds from the other injuries.

Keywords: histology; phase contrast, gunshot wounds; stabbed wounds.

FATAL OUTCOME OF A REPEATED SELF-INFLICTED CARDIAC INJURY IN A PATIENT WITH CHRONIC PSYCHIATRIC ILLNESS: A CASE REPORT

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The patient was a 38-year-old male with a documented psychiatric history dating back to age 14, including long-term child and adolescent psychiatric care. At age 24, he was diagnosed with acute polymorphic psychotic disorder with schizophrenic symptoms, unspecified schizophrenia, and unspecified anxiety disorder. At age 25, the patient attempted suicide by multiple self-inflicted stab wounds to the chest. This resulted in pulmonary injury, hemothorax, cardiac injury, and hemopericardium, requiring emergency thoracic surgery. The cardiac injuries involved penetrating stab wounds to the anterior wall of the left ventricle and the interventricular septum without perforation into the ventricular cavity. Surgical management included chest and pericardial drainage, suturing of cardiac and pulmonary injuries, and subsequent uneventful removal of the drains. At age 38, his psychiatric documentation listed diagnoses of paranoid schizophrenia, bipolar affective disorder, and alcohol abuse. In the same year, he again inflicted a stab wound to his chest with suicidal intent. After to the act, he called his mother, informing her that he had attempted to stab himself in the heart. Emergency medical services were alerted and found him in a hemodynamically stable condition without significant external bleeding. He was transported to a trauma unit. Imaging and surgical findings revealed hemothorax, pneumothorax, injury to preexisting pleural callus on the left side, pericardial injury, and a penetrating wound to the anterior wall of the right ventricle extending into the right ventricular cavity. The injuries were associated with localized hemorrhage adjacent to the pericardium and pulmonary trunk. Despite these findings, there was no significant tamponade or mediastinal compression. The patient remained stable during transport and initial hospital care. During thoracic surgery, while attempting to separate pleural adhesions, sudden and profuse bleeding occurred from the direction of the pericardium. Hemostasis could not be achieved, resulting in hemorrhagic shock and death. The cause of this catastrophic hemorrhage was determined to be the disruption of adhesions and tamponade effect formed between the pleural and pericardial layers as a sequela of the previous chest trauma. This finding was confirmed by medicolegal autopsy.

Keywords: self-inflicted chest trauma; schizophrenia; cardiac injury; hemorrhagic shock; pleural adhesions

CONCORDANCE OF CAUSES OF DEATH DETERMINED BY FORENSIC AUTOPSIES AND CLINICAL DIAGNOSES

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Aim: The aim of this study is to determine the degree of concordance between clinical findings and those established by forensic autopsies, with respect to the time elapsed from admission to death, the nature of death, and the type of clinical setting in which treatment was administered.

Materials and Methods: An analysis was conducted on 718 autopsy reports prepared in 2023 at the Institute of Forensic Medicine in Niš. The concordance between clinical and autopsy findings was assessed in relation to the duration of hospitalization (death within 2 hours of admission, within 12 hours, within 24 hours, within 48 hours, within 7 days, and after more than 7 days), the natural or violent cause of death, and the clinical department where treatment was provided.

Results: Of the total number of autopsies analyzed (718), 618 cases were determined to have a natural cause of death, while 100 cases had a violent cause of death. Concordance between autopsy and clinical findings was observed in 53.2% of cases with natural causes of death and in 85% of cases with violent causes of death. The degree of concordance between clinically and autopsy-determined causes of death increased with the length of hospitalization: up to 2 hours of admission – 42%, up to 12 hours – 60%, up to 24 hours – 63%, up to 48 hours – 72%, up to 7 days – 78%, and more than 7 days – 83%. The highest concordance was found in the neurosurgery clinic (89%), while the lowest was observed in the neurology clinic (45%). Longer hospitalization allows for more extensive modern diagnostic procedures, such as MRI and MSCT, which explains the higher accuracy of clinical diagnoses over extended treatment periods.

Statistical Analysis: A chi-square test for independence was conducted to evaluate the relationship between hospitalization duration and concordance rates. Results showed a statistically significant association ($\chi^2 = 47.32$, $p < 0.001$). Logistic regression analysis indicated that extended hospitalization significantly increased the likelihood of concordance (odds ratio [OR]: 1.18 per additional day, 95% CI: 1.12–1.25, $p < 0.001$).

Conclusion: Our results clearly demonstrate that with longer hospitalization, and consequently greater opportunities for adequate diagnostic procedures, the accuracy of clinical diagnoses, including accurate determination of the cause of death, improves, as confirmed by subsequent autopsy findings.

Keywords: forensic autopsy, clinical diagnosis, concordance

EXPOSURE TO ASBESTOS AND WORK-RELATED DEATHS: FORENSIC CHALLENGES FROM A NINE-YEAR EXPERIENCE

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Introduction: Although the use of asbestos has been legally banned in Italy since 1992, a significant number of judicial autopsies are still being requested for deaths presumably linked to such exposure, due to the long latency period of asbestos-related diseases. We present a descriptive retrospective study aimed at characterizing deaths subjected to autopsy ordered by the Public Prosecutor's Office due to a history of previous asbestos exposure.
Material and Methods: We examined the results of judicial autopsies carried out over the last 9 years (2016-2024) at the Institute of Legal Medicine, University of Udine. Inclusion criteria were: a request to determine previous asbestos exposure provided in the judicial questions; analysis of lung tissue for asbestos bodies using the "National Working Group Biofibre" method; confirmed cause of death; autopsy reports already filed; application of the 2014 "Helsinki Criteria" for attributing diseases to asbestos exposure.
Results: A total of 132 cases met the inclusion criteria; all investigations were conducted against unknown persons. The sample was composed of 122 males (92.4%) and 10 females (7.6%), aged between 46 and 93 years (median 76.5). Causes of death were: primary lung cancer in 65 cases (49.24%); pleural mesothelioma in 30 (22.73%); non-pleural mesothelioma in 4 (3%); one laryngeal cancer (0.76%); one ovarian cancer (0.76%); cancers not attributable to asbestos exposure in 7 cases (5.3%); fibrotic interstitial lung diseases in 6 (4.55%) and 18 other non-asbestos-related causes 13.64%. Asbestos body count in lung parenchyma was positive in 95.45% of cases, ranging from 110 to 1,700,000 bodies/g of tissue (median 3,690). Occupational exposure, defined as a count >1000, was identified in 91 cases (69%). A causal link between exposure and death was recognized in 77 cases (58.3%). Other variables considered included the distribution of pleural lesions (plaques, adhesions, and effusions), type of previous occupational exposure (job role and location), disease latency, previous smoking history, and asbestos exposure already recognized by the specific Italian Public Institutions.
Discussion: In the Italian criminal justice system, asbestos exposure is legally significant even when it is only one of multiple contributing factors in a death, requiring investigations into potential violations of occupational safety regulations. No guidelines or legal thresholds currently exist to determine the level of exposure above which asbestos exposure should be considered criminally relevant. Therefore, it is essential to establish shared criteria to avoid excessive inconsistencies in the forensic assessment of these fatal occupational diseases.

Keywords: forensic autopsy; asbestos; work-related death; retrospective study; criminal liability.

CAUSAL RELATIONSHIP BETWEEN AMINOPHYLLINE AND SUDDEN CARDIAC DEATH-CASE REPORT

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Aminophylline (theophylline-ethylenediamine) is a bronchodilator from the methylxanthine group used in the treatment of asthma, chronic obstructive pulmonary disease, and chronic bronchitis. Aminophylline has a narrow therapeutic index, which is why serum drug concentrations above 20 μg/mL can cause toxic effects that progressively intensify at higher serum concentrations, especially in patients with heart conditions. Heart failure increases the risk of toxicity, which manifests itself in the form of agitation, nausea, vomiting, abdominal pain, and arrhythmias.

We present the case of a 56-year-old man who was found dead in bed by his wife in the early hours of the morning. He had a history of heart and lung disease.

Based on the autopsy findings and all the analyses performed, it follows that death occurred directly due to the disruption and cessation of cardiac and respiratory function, resulting from a sudden deterioration of long-term severe heart disease and a sudden worsening of respiratory function. Long-term heart muscle disease is reflected in long-standing thickening of the heart muscle, degenerative changes in heart muscle fibers, diffuse connective tissue infiltration of the heart muscle, and thickening and narrowing of the coronary arteries. Toxicological-chemical analysis of blood, urine, and organs determined toxic concentrations of aminophylline, which, by themselves and in interaction with therapeutic concentrations of other drugs identified by the analysis, could have contributed to the sudden worsening of long-term heart disease, the deterioration of respiratory function, and ultimately, death.

Theophylline (aminophylline) administration is associated with tachycardia (rapid heartbeat). It is usually sinus but can manifest as supraventricular or ventricular tachycardia with extrasystoles of the bigeminy type or even ventricular fibrillation at high serum drug concentrations. In patients with hypertension and heart disease, toxic concentrations can cause life-threatening arrhythmias, which is why monitoring serum drug concentrations is recommended when administering this medication to prevent toxicity. Cardiovascular collapse with hypotension and respiratory failure occurs in the most severe cases.

Keywords: forensic toxicology; heart disease; sudden cardiac death; aminophylline.

ELECTRON MICROSCOPY IN FORENSIC MEDICINE

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Introduction: Electron microscopy (EM) was established in medical practice in the 1970s, and provides insight into changes at the subcellular level that are specific to certain pathological diseases. Nowadays, EM is used primarily in research and in the routine diagnosis of non-neoplastic disorders, in kidney diseases, metabolic diseases, musculoskeletal disorders, peripheral nerves diseases, as well as microbial diseases.
The aim of this study is to present a case in which EM defined the cause of sudden, unexpected death of a woman in labor. The Transmission Electron Microscope (TEM) of the Department of General Pathology and Pathological Anatomy, Faculty of Medicine, University of Rijeka was used in the diagnosis. TEM is an indispensable part of larger hospital systems and medical centers in the world and in our country. It is used to observe samples that are permeable to electrons, can tolerate vacuum, and are small enough to fit into a vacuum chamber. TEM has the highest possible magnification and provides information about the elements and structure of the observed sample. With proper training, it is easy to use, while preparation of the samples is demanding and requires adequate education of laboratory staff in order to properly take the sample in the pre-analytical phase, according to standardized protocols, adequately process it and make ultra-thin sections, and avoid artifacts. At the Department of Forensic Medicine and Criminalistics of the Faculty of Medicine in Rijeka, after the autopsy of a 32-year-old woman in labor, on May 24, 2011, the death of the woman in labor was classified as natural, but it was not possible to define the exact cause of death. By reviewing the preparation of the woman in labor and using TEM, the exact cause of death of the woman in labor at the age of 32 was defined. It is a sudden and unexpected cardiac death, and the use of TEM enabled the visualization of structural damage in heart cells, and in this specific case it was proven that it was at the level of mitochondrial damage.
Conclusion: EM is a demanding examination both in terms of procedures and in financial terms. It requires special equipment maintenance and adequate accommodation because the microscopes are large. When there is a possibility of using electron microscopy in forensic practice with the right indications and the correct method of taking samples, a defined cause of death is obtained with an exact answer to the question of why the woman in labor died.

Keywords: electron microscopy; transmission electron microscope; sudden and unexpected cardiac death; forensic autopsy.

CASE REPORT: SEVERE FETAL ANOMALIES FOLLOWING OCCUPATIONAL EXPOSURE IN A TEXTILE WORKER

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Occupational exposure to various chemical agents within the textile industry represents a significant potential risk factor for adverse reproductive outcomes.
This case report presents a pregnancy termination resulting from severe fetal anomalies in a woman employed in the textile sector, with a documented history of occupational exposure spanning from 2002 to 2021. The initial autopsy and histopathological examinations were superficially interpreted, and it was only through subsequent multidisciplinary forensic analyses—including chemical-toxicological and histological investigations—that a direct link was established between chemical exposure and fetal poisoning.
A distinctive feature of this case lies in the application of Inductively Coupled Plasma Mass Spectrometry (ICP-MS) on paraffin-embedded fetal tissue samples, necessitated by the considerable lapse of time since the autopsy. These analyses revealed significantly elevated concentrations of heavy metals—specifically Lead, Nickel, Mercury, and, most notably, Chromium—within fetal tissues. Furthermore, it was determined that the worker had developed sensitization to nickel sulfate, potassium dichromate, and formaldehyde during her employment.
The findings strongly support the hypothesis that prolonged exposure to these substances, commonly used in textile manufacturing processes, was a contributory factor in the adverse pregnancy outcome. From a forensic-medical perspective, the case ultimately facilitated the attribution of legal responsibility to the employer, due to the failure to adequately monitor and protect the health of the worker.

Keywords: occupational exposure; fetal malformations; heavy metals; formaldehyde; textile industry.

AGE ESTIMATION IN CHILDREN: INSIGHTS FROM A NEW BOSNIAN-HERZEGOVINIAN FORMULA

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Introduction: In recent years, the use of precise age assessment methods on living individuals has become increasingly important in the forensic field. The aim of this study was to develop, for the first time, a Bosnian and Herzegovinian-specific formula based on our local dataset, utilizing the LASSO model to uncover and leverage the unique characteristics of the Bosnian-Herzegovinian population. Methods: This research is undertaken to address the need for a Bosnia-Herzegovina-specific equation capable of accurately predicting a child's age using local data. The dataset covering the details of 205 Bosnian boys and girls, spanning from 7 to 13 years, to maintain representativeness and reduce potential age-related biases. Three distinct models were considered, each inspired by existing approaches but adapted to the specifics of the local dataset. The first model, based on the Belgrade equation, incorporated predictors x3, x7, and N0. The second model extended the European equation by including N0, x5, s, and the interaction term s·N0. The third model adopted a linear regression framework with Lasso regularization, which used all available predictors (x1, x2, x3, x4, x5, x6, x7, s, N0, s·N0). It would be recommended that in the future the BH equation that has the form of the European one that specifically uses the x5 tooth with gender, sum and product be used.
Results: A linear model with fewer parameters is generally preferred, as the results between Lasso and such models are ultimately negligible. In this study, we explored the use of Lasso model as a method to identify which teeth contribute most to dental age estimation within a linear modeling framework.
Conclusion: By comparing Lasso's performance to the customized European formula for the Bosnian-Herzegovinian population, we found that the results were similar, and in some cases, Lasso even performed slightly better. Given that the European formula relies on fewer features, it presents a practical and efficient alternative as a final model for Bosnian-Herzegovinian dental age estimation.

Keywords: age, estimation, BHF, children, odontology, forensic dentistry.

NEITHER TREE BRANCH NOR IRON PIPE: FATAL KIDNEY RUPTURE CAUSED BY A THIN PIECE OF FIBREGLASS-REINFORCED TENT POLE?

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Upon the autopsy of the body of a homeless man found dead in front of his collapsed tent, the typical tramline bruises and the rupture of the left kidney did not cast doubt regarding the type of instrument that caused the lethal injury.
The victim was assaulted by several people, and the thick, knobbly tree branch, the very light, thin-walled iron pipe and the broken glass collected by the investigating authority at the scene clearly explained the vast majority of the almost 40 skin injuries.
However, these objects in no way appeared to be capable of causing the kidney rupture and the concomitant skin lesion found on autopsy.
A careful study of the photographs taken at the site revealed the absence of one end of a bendable tent pole made of several, about 50 cm long pieces of tubular fibreglass-reinforced plastic, and the presence of the missing piece not far from the victim's foot, with a clearly visible disintegrated fibreglass structure.
With the presented case we would like to draw attention to the existence of "unconventional" injury-inducing objects and the importance of finding them, since the discovery of such a less dangerous looking tool can have a significant influence on the judges' assessment of the intention of the person who inflicted the injury using them.

Keywords: tramline bruise, fiberglass tent pole, renal rupture.

WHEN LIVESTOCK TURNS LETHAL: A CASE OF FATAL THORACIC TRAUMA INFLICTED BY A RAM

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This case report presents a rare and fatal incident involving a domesticated ram fatally injuring a elderly female shepherd. Initially misclassified as a potential hit-and-run due to the body's roadside location. Forensic investigation including external examination, full autopsy, histopathological analysis, and contextual evidence revealed that the cause of death was multiple blunt force injuries inflicted by an aggressive ram. The external findings consisted of localized contusions and patterned bruises over the posterior thorax and lumbar region. Internally, heamtothorax, bilateral posterior rib fractures, extensive soft tissue hemorrhages, multifocal thoracic vertebral fractures with dislocation, vertebral spinous process fractures, pulmonary contusions, and spinal cord contusion were observed. The pattern and concentration of injuries demonstrated repetitive, focused impacts to the posterior and lateral thoracic region that were inconsistent with road traffic accidents but aligned with trauma caused by repeated head butting by a ram. Scene investigation confirmed the presence of a empty feeding bucket next to the deceased and the presence of a sheep heard in the near vicinity. This unique case emphasizes the need to consider animal-inflicted trauma in forensic differentials when injuries are atypical for more common accidental mechanisms. It also highlights the considerable force domesticated animals can exert, with the potential to cause lethal injuries. The case contributes to the limited but growing body of forensic literature on fatal animal attacks, particularly involving livestock.

Keywords: forensic pathology; blunt force trauma; fatal animal attack, ram injuries, vertebral fractures.

THE IMPACT OF THE COVID-19 PANDEMIC ON SEXUAL VIOLENCE DYNAMICS AND VICTIM CHARACTERISTICS IN LITHUANIA

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Introduction: During the COVID-19 pandemic and the associated lockdown measures, concerns about increased psychological and economic instability, as well as the reduction of social services, were raised. These factors are believed to have heightened the risk of domestic violence, including sexual violence. This study aims to examine the effects of the COVID-19 pandemic on the dynamics of sexual violence and the characteristics of its victims in Lithuania.
Materials and Methods: Retrospective analysis of data from the National Register of Criminal Acts on crimes against the freedom and integrity of sexual self-determination in Lithuania was conducted. Data from pre-pandemic (2018-2019) and pandemic periods (2020-2021) was analysed and compared. The collected data was processed using Microsoft Excel and the R software.
Results: A total of 451 cases of sexual violence were registered in Lithuania during the pre-pandemic period (2018-2019), while 285 cases were reported during the pandemic period (2020-2021). In both periods, the majority of cases were rapes. The number of registered cases decreased slightly in both, pre-pandemic and pandemic periods, with no statistically significant difference. The pre-pandemic period recorded 497 victims, while the pandemic period recorded 303 victims, with up to 90.4% of them being female. In both periods, the majority of victims were targeted by acquaintances. The age of the victims ranged from 1 to 91 years old. The average age during the pre-pandemic period was 21.3±17.73, while during the pandemic period it was 19.2±12.38. When comparing the pre-pandemic and pandemic periods, sexual violence against minors slightly increased; however, the difference was statistically non-significant (p=0.24). In both periods, the majority of victims had a school-level education, accounting for up to 72.9% of all cases. The number of crimes committed under the influence of alcohol slightly decreased, but this change was statistically insignificant. During both periods, most reports indicated that there was no damage to physical health (44.1% and 42.9%, respectively). However, during the pandemic period, the overall percentage of non-severe and severe health impairments increased, with a statistically significant difference in proportions.
Conclusions: During the pandemic in Lithuania, the overall number of sexual violence reports saw a slight decline, though the difference was not statistically significant. The average age of victims also decreased, without reaching statistical significance. The findings of this study suggest that while fewer cases of sexual violence were reported, those that were reported tended to result in more severe physical health consequences.

Keywords: sexual assault; sexual violence; sexual crimes; COVID-19; lockdown.

TURQUOISE DISCOLORATION OF INTERNAL ORGANS FOLLOWING METHYLENE BLUE ADMINISTRATION IN A PATIENT WITH SEPTIC SHOCK: A CASE REPORT

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We present the case of a 54-year-old male who died of septic shock secondary to pneumonia caused by the influenza A virus and *Streptococcus pyogenes*. He was treated in an intensive care unit (ICU), where he received methylene blue in addition to antibiotics, intravenous fluids, vasoactive drugs, and venovenous extracorporeal membrane oxygenation (ECMO) support along with mechanical ventilation. Methylene blue can serve as an adjuvant therapy in septic shock. It acts as an inhibitor of soluble guanylate cyclase, reducing excessive nitric oxide production in vascular smooth muscle cells, promoting vasoconstriction, and increasing arterial blood pressure. Postmortem examination revealed a turquoise-blue discoloration of internal organs, most prominently in the brain and heart, but also involving the kidneys, vessels, and pancreas. The discoloration deepened to a darker blue after exposure to oxygen for a few minutes but completely faded by the time of histologic examination. It is important for a forensic pathologist to obtain comprehensive medical records to differentiate methylene blue–induced discoloration from other potential causes, such as putrefaction, disulfide poisoning, treatment with toluidine blue, dextropropoxyphene, flunitrazepam, or ingestion of substances containing warning dyes.

Keywords: septic shock; methylene blue; blue organ discoloration; postmortem findings; autopsy

SUIDES IN HEALTHCARE INSTITUTIONS IN ZAGREB AND ZAGREB COUNTY

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Suicide, a leading cause of violent death in both Croatia and globally, is a pressing public health concern. The urgency of this issue is underscored by the higher suicide rates among hospitalized patients compared to the general population. This study is a timely examination of the frequency, circumstances, and specific risk factors associated with suicides within healthcare institutions. Our specific objectives include investigating the number of suicides and mechanisms of death, determining the distribution of suicides by gender, age, and duration of hospitalization, and analyzing the existing history of psychiatric and other illnesses in individuals who committed suicide in healthcare institutions in Zagreb and Zagreb County from 2014 to 2024.

The findings of this study, which reveal that suicides in healthcare settings are often linked to severe psychiatric and somatic illnesses, have significant implications for the development of evidence-based prevention strategies. Between 2014 and 2024, a total of 1,684 suicides were committed in the area of Zagreb and Zagreb County, of which 71 occurred within healthcare institutions. The majority of these suicides took place in nursing homes (39.44%) and general clinical hospitals (35.21%). Data analysis showed that most suicides were committed by men (75%), with an average age of 65.15 years, and the most common method was jumping from a height (56.34%). Additionally, distributions by gender and age, as well as methods of suicide in healthcare institutions, were analyzed. Data were collected on the reasons for hospitalization and the departments where patients were located at the time of suicide. A particular focus was placed on differences in distribution between general and psychiatric hospitals, revealing significant variations in methods of suicide and age.

In the concluding part of the study, we identified key shortcomings in existing data sources for this type of research and considered possibilities for their improvement. We found that systematic collection of specific types of data, such as: a) information about hospital departments where patients were located at the time of suicide and b) diseases from which they suffered, could greatly facilitate the analysis of suicide issues in healthcare institutions. This analysis is crucial for designing evidence-based prevention strategies, underscoring the importance of our collective work in this field.

Keywords: suicide; healthcare institution; risk factors; data sources.

UNUSUAL CASE OF SUICIDAL HANGING WITH TIED HANDS

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Hanging cases are generally suicidal, whereas homicidal hanging cases are sporadic. Suicide by hanging with the hands tied behind the back is not only difficult to commit but also rare. Detailed and careful examination of the scene, thorough medico-legal autopsy, examination of ligatures, and knowledge of the personal history of the deceased remain crucial to deciding the manner of death. A 36-year-old man, a musician, was found in his yard hanged with hands tied behind his back. The loop was made of wire, without a knob, while the arms were tied with a cotton cord. A towel was found underneath the wire on the neck used for padding. The front of the clothes was soaked with blood from the nose. The hook to which a wire was tied at 200 centimeters was found on the crime scene. A suicide note was also found with the motive for the suicidal handing. At the autopsy, hyperemia of the conjunctiva, hematoma of the subcutaneous tissue in the neck area, tear of the right carotid, ecchymoses subseroses of the lungs and heart, and liquid blood were found. Toxicological tests were negative. The forensic medical examiner should keep an open mind about all possibilities. Detailed analysis of circumstantial evidence, information obtained from the crime scene, and results of external and internal examinations can help in establishing the manner of death.

Keywords: suicidal hanging; manner of death; tied hands.

RETROSPECTIVE STUDY OF HOMICIDE AND HOMICIDE FOLLOWED BY SUICIDE IN SOUTH-EASTERN SERBIA IN 22-YEAR PERIOD

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In heterogeneous group of homicides (H), a special emphasis is given to a homicide followed by suicide (H-S), which represents the suicide of the perpetrator after killing one or more people. This study was performed to investigate wide range of individual and social characteristics of perpetrators and victims and situational characteristics of H and H-S. Our research covered the period 2000-2022, in which 529 homicide cases and 86 dyadic murder cases occurred. According to our study, the percentage of H-S was 16.25%, with rate of 0.26 per 100,000 persons per year. Homicide was typically committed by 39 years old male, resided in urban areas, with completed elementary school, unemployed, almost every fourth with a criminal record. In almost third of them alcohol was present at the moment of critical event. From the other hand, typical DH was committed by 48 years old male, resided in urban areas, with completed high school, unemployed, most of them without previous criminal records. In less than fifth of them alcohol was present at the moment of critical event. Three quarter of perpetrators committed suicide on the day of the homicide, mostly by shooting themself with pistol in the head, but also more than a quarter by hanging. Typical victim of H was 50 years old male, resided in urban areas, with completed high school, employed or pensioners. In quarter of them alcohol was present at the moment of critical event. In more than third cases H was committed by shooting with handgun, more than one fourth of cases by beating and almost one fifth by stabbing. Typical motive in H was disagreement/dispute, one third of H were committed in victim's apartment and one fifth in a public space. Typical victim of DH was 44 years old female, resided in urban areas, with completed high school education, employed, married, almost all alcohol and PAS negative. More than half of DH were committed by shooting. Typical motives were partner abandonment/threat of abandonment and pathological jealousy. More than one third of DH were committed in a shared house/apartment and one forth in the victim's apartment. In most cases of H it was committed against acquaintances/neighbors, then in cases without any relationship, where as DH were committed mostly against spouses and common-law partners.

Keywords: homicide, homicide-suicide, south-eastern Serbia.