ORAL PRESENTATIONS

POSTMORTEM IMAGING – AN IMPORTANT STEP TO THE OBJECTIFIED KNOWLEDGE OF FORENSIC FINDINGS AND EXPERT OPINION. THE AUTOPSY PROTOCOL IN THE MIRROR OF HISTORY

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The core business of every expert – it does not matter from which field – is based on the task given to him or her by the judicature to report "findings and an opinion." This is because an opinion must be founded on findings. These are usually then summarized as diagnoses or diagnosis groups. The findings thus form the objective foundation for a personal – that is, subjective – interpretation or an opinion. In this process, the report of the findings, as well as the opinion must occur "according to the best knowledge and conscience".

The central function of the expert lies primarily in reporting the findings on the basis of which the specialist draws his or her argumentation. Through this the expert makes available the facts that are the empirical structure of the case that the court is to decide upon. In this function, the expert complements the expertise of the judge and is thus solely responsible for the correctness of the findings and opinion presented. The expert is obliged to transmit truth in reporting the findings. For this reason, the expert must be highly objective.

The aim of documentation of autopsy has always been a "precised and particularized recording, which grants a complete and faithful perception of the viewed objects" (E. v. Hofmann).

The development of imaging methods allows for placing the documentation on a new level – the "mechanical objectivity", as the images, which have been generated digitally on the basis of physical data, now become the objective basis of the critical, intersubjective discourse (K. R. Popper).

The reporting of findings consists of four parts, which are display, determination, documentation and storage of findings. In all the four parts, the post-mortem imaging approach leads to better solutions regarding objectivity. This is shown with examples.

TECHNICAL WORKING GROUP POSTMORTEM ANGIOGRAPHY METHODS: DEVELOPMENT OF MULTI-PHASE POSTMORTEM CT-ANGIOGRAPHY AND CREATION OF AN INTERNATIONAL NETWORK

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Performing a postmortem MDCT (multi-detector computed tomography) scan is today a routine exam in some forensic institutes, especially in Switzerland. However, an unenhanced CT-scan yields no detailed information about inner organs and blood vessels. To overcome this drawback, postmortem CT-angiography can be performed. Different techniques have, therefore, been proposed. Most of these methods remain in the realm of research techniques without an application in the daily routine. With respect to the current development of postmortem imaging, there is a need to define a standardized method and

technical equipment prerequisites in order to also transform postmortem CT-angiography into a routine examination that can find acceptance in the medico-legal society. The research group for post-mortem CT-angiography in Lausanne has developed such a technique, called the Multi-phase Postmortem CT-angiography (MPMCTA). It consists of the performance of one native CT-scan and three angiographic phases, which are performed after and during the perfusion of the body with a mixture of paraffin oil and an oily contrast agent that has been specially developed for this technique. Additionally, adequate technical equipment has been introduced. Using this approach permits to obtain radiological images of high quality which allow for investigating the vascular system in a way which is impossible using conventional autopsy and seems to be even superior to clinical CT-angiography. By using the MPMCTA approach, the sensitivity of the radiological exam regarding potentially essential vascular findings can be significantly increased. Depending on what findings are sought for, its sensitivity is even higher than the one of conventional autopsy. This means that some cases should absolutely be examined using this new technique, especially cases in which the source of a hemorrhage or a modified vascular anatomy as a result of a surgical intervention need to be detected. However, in order to avoid misinterpretation of the radiological data, it is important to know the pitfalls and limitations of the new technique. First studies with the aim to define the advantages and limitations have already been carried out. In order to define standards for postmortem angiography, an international working group called TWGPAM (Technical Working Group Postmortem Angiography Methods) was created in the spring of 2012. It consists of nine participating institutes of legal medicine situated in six different European countries. Each institute provides a team of forensic pathologists, radiologists and radiographers, which contribute to a common database used for multi-center studies. This presentation explains the development of MPMCTA and the technical equipment. It will also introduce the new international working group and give an overview of its most recent activities and ongoing studies.

POST-MORTEM CT-ANGIOGRAPHY OF THE BRAIN AND CRANIOCERVICAL JUNCTION

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Purpose: State of the art routine work of legal medicine is incrementally facilitated by unenhanced post-mortem computed tomography (PMCT) with little information about the vasculature due to a lack of contrast. The recently established PMCT-angiography (PMCTA) is performed in order to provide a precise display of vascular and tissue lesions. Vascular pathologies of the head/neck region are cumbersome to dissect manually during autopsy, whilst only targeted preparation is feasible and simultaneously, destruction of other potential forensic findings will occur. The aim of this study was to evaluate if PMCTA of the craniocervical region is a necessary tool to improve quality of autopsy. **Methods and Materials:** A retrospective analysis of 92 consecutive deceased victims examined with PMCTA was evaluated. All the bodies underwent subsequent autopsies. Unenhanced PMCT was performed, followed by achieving subsequent access to the femoral vessels in order to perform PMCTA with an arterial and venous injection. A contrast media mixture of polyethylene glycol and Iopentol was administered. **Results:** The findings of PMCTA could be validated by autopsy. In cases with rupture, aneurysms or dissection of the basilar, vertebral and carotid artery, venous laceration and severed brain stem injury below the level of the foramen magnum, PMCTA even proved to be superior to autopsy. **Conclusion:** PMCTA provides the basis of a focused and quality-improved preparation of the craniocervical junction and intracranial vasculature by revealing pathologies that are frequently missed during autopsy. The newly implemented method of PMCTA has proven to be an adjunct to classic autopsy in detecting neuropathological causes of death.

COMPLICATIONS OF HEART SURGERY IN PMCT AND PMCT-ANGIOGRAPHY

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Background and Purpose: Death after heart surgery provokes the question whether the intervention, the underlying disease or other pathologies have caused the unfortunate outcome. Autopsy can answer this question in some cases. However, autopsy means effort and costs. To obtain consent may be an obstacle. Furthermore, autopsy destroys/modifies the corpse and the surgical field, which complicates the interpretation. These facts have prompted our investigation. Our objective was to find out whether PMCT and PMCT-angiography can contribute to the analysis of an unfortunate outcome of heart surgery. **Material and Methods:** Since 2008, the Institute for Forensic Medicine of the University Hospital Eppendorf, Hamburg, has performed some 4000 PMCT's. Till 2011, the examination was performed with a 6-row scanner (Philips M 8000: whole body CT, scan thickness 1.2 mm, pitch 1.0; 200 mAS, 120 kV), and thereafter with a 16-row scanner (Philips: whole body CT, scan thickness 1.0 mm, pitch 1.0; 200 mAS, 120 kV). PMCT-angiographies are performed with an oily contrast substance: arterial phase, venous phase, circulation; a modified pump from the heart surgery injects. The heart is scanned with 0.8 thickness, pitch 1.0. Ninety-six PMCT-angiograms have been performed to date; they have been reviewed for complications due to heart surgery. Additionally, observations of complications of heart surgery documented with PMCT have been included. **Results:** PMCT visualized pseudoarthrosis of the breast bone, bleeding into the pericardium, the mediastinum and the pleural space, pneumothorax, failures of drains, malposition of pacemakers, tracheal tubes, drains, gastric tubes. Single observations concerned a cardioesophageal fistula, the position of implanted valves, and intravascular air and gas. PMCT-angiography localized (and eliminated) suture insufficiency, bleeding due to coagulation disorders, insufficiency of an implanted valve, a valve-in-valve therapy attempt, thrombi and vascular occlusion. **Conclusion:** PMCT provides evidence concerning complications after heart surgery. PMCT-angiography visualizes sutures, lumina of the heart, arteries and veins, it localizes valves in relation to the ostia of coronary arteries; PMCT-angiography localizes the bleeding vessels. The digital data allow a repeated 3D display, which facilitates a review. Any unit with a CT-scanner can perform PMCT and PMCT-angiography. PMCT and PMCT-angiography allow the analysis of an unfavorable outcome and they can contribute to quality control.

COMPLICATIONS AFTER TRANSVASCULAR INTERVENTIONS IN THE HEART IN PMCT AND IN PMCT-ANGIOGRAPHY

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Background and Purpose: After transvascular catheter interventions involving the heart and the aorta, a lethal outcome raises the question what caused death. Autopsy can answer this question. However, autopsy means effort and costs. This leads to the review of material collected by the authors with the intention to clarify in what way post mortem CT (PMCT) and PMCT-angiography can contribute to the investigation of death after interventions involving the heart and the aorta. **Material und Methods:** Since 2008, the Institute for Forensic Medicine of the University Hospital Eppendorf, Hamburg, has performed some 4000 PMCT procedures. PMCT-angiographies are performed with an oily contrast substance: arterial phase, venous phase, circulation; a modified pump from the heart surgery injects. The heart is

scanned with 0.8 thickness, pitch 1.0. Ninety-six PMCT-angiograms have been performed to date; they have been reviewed for complications due to transcatheteral interventions involving the heart and the aorta. Additionally, observations of complications of transvascular interventions in the heart and the aorta documented with PMCT have been included. **Results:** PMCT visualizes bleeding into the pericardium, the mediastinum, the pleural space and the retroperitoneum. It shows the implanted valve (TAVI) or stent and their position. After aorta stenting, stent migration, angulation, perforation and local bleeding become visible as the localization of the stent and its relation to the ostia of large and small arteries. PMCT has the advantage of showing even small amounts of air in the coronary arteries and other vessels. In case of air or decay gas in the vessels, the leaves of the cardiac valves can be seen and analyzed; this is also valid for implanted valves and other devices. PMCT-angiography identifies the bleeding vessel, allows for the detection of thrombi or emboli, the localization of a perforation into and through the myocardium, provides a proof of intracardial rupture and shunting due to dilatation of the aortic valve in TAVI. **Conclusion:** PMCT permits statements concerning complications of transvascular catheter interventions involving the heart and the aorta. PMCT-angiography allows for the identification of the bleeding vessel, the localization of stents and implanted valves and their relation to the ostia of other vessels. Vascular stenosis and obstructions are visible. The digital data permits repeated analyses also in 3 D. PMCT and PMCT-angiography can be performed in any unit which has a CT scanner. They can contribute to quality control.

AN UNUSUAL HOMICIDAL STAB WOUND OF THE CERVICAL SPINAL CORD: A SINGLE CASE EXAMINED BY POST MORTEM ANGIO COMPUTED TOMOGRAPHY

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Cases of spinal cord injuries secondary to stab wounds are rare in the literature. In North America, spinal cord traumatisms represent 2.6% of all the traumas, and only 1% is secondary to stab wounds. In most cases, those injuries in North America are secondary to ballistic trauma. In a South African study consisting of 450 cases of stab wounds, the complete cervical spinal cord represented only 4.5% of the cases. Survivors in the majority cases presented with neurological sequels, like tetraplegia or Brown-Sequard syndrome, and lethal cases were rare. We report a case of a 26-year-old woman killed by her girlfriend secondary to multiple stab wounds. A post mortem angio computed tomography was performed before the medico-legal autopsy. The body was prepared with a surgical cannulation of the femoral vessels. After a non-MSCT exploration, a controlled perfusion device (Virtangio® machine) was used with paraffin oil mixed with special contrast agent (Angiofil®), allowing for three time-different acquisitions (arterial, venous, dynamic). This exploration permitted to reveal multiple stab wounds (facial, thoracic, and cervical), with two severe lethal cervical lesions. One of the cervical lesions was located at the upper posterior part of the neck, with a horizontal trajectory, and a complete transversal section of the cervical spinal cord, between the first and the second cervical vertebrae. This lesion was accompanied with venous and arterial sections. The second cervical lesion was anterior, located on the right side, at the base of the neck, and presented along its trajectory an injury of the right internal jugular vein, and a section of the right transverse apophysis of the seventh cervical vertebra. At the facial level, fractures of the right mandible were noted, along the path of one stab wound. At the chest level, a right hemo-pneumothorax was noted, with one scapula bone lesion, secondary to one posterior stab wound. At autopsy, exploration of the spinal cord is always a particular challenge. The access may be anterior or posterior. In this case,

the dissection was easier because of the imaging conclusions. The precise localization of the injured vessels at the upper cervical posterior area was possible only with imaging. Of course only the external examination permitted an exhaustive description of the different wounds. This unusual case due to stab wounds illustrates the complementarity of the post mortem angio computed tomography and autopsy in instances involving those kinds of lesions.

APPLICATION OF MPMCTA TO INVESTIGATING VASCULAR PATHOLOGY AND MODIFIED VASCULAR ANATOMY: A SPECIAL CASE OF "VASCULAR PATCHWORK"

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Introduction: Multi-phase Postmortem CT-angiography (MPMCTA) has become a routine examination for investigating cases of traumatic deaths and natural deaths in the University Center of Legal Medicine Lausanne-Geneva. This presentation describes a case, in which multiple cardio-vascular changes have been visualized by the new technique. **Case report:** The body of a 71-year-old man was found at his home. The deceased had a long medical history including multiple vascular pathologies and interventions, especially a double coronary bypass, a subclavian stent and an axillo-bifemoral bypass. In view of the vascular anamnesis, the indication to perform MPMCTA was given. Due to a complete occlusion of the femoral arteries, the arterial phase of MPMCTA was impossible to be carried out using the standard procedure. The protocol could, however, be used once the cannulation site was switched from the femoral artery to the axillo-femoral bypass. A conventional autopsy and histological analyses were carried out later on. **Results:** By cannulating directly the lumen of the vascular prosthesis and injecting the contrast-agent mixture into the bypass, the whole vascular system of the head, thorax and abdomen could be visualized. The modified vascular anatomy and all vascular pathologies could be demonstrated in detail. The diagnosis of Leriche syndrome, severe coronary artery disease with an old cardiac infarction and general arteriosclerosis could be established. Additionally, MPMCTA proved the permeability of the two coronary bypasses, the axillo-bifemoral bypass and the subclavian stent. **Discussion:** Axillo-femoral bypass is a method of surgical revascularization used in the setting of symptomatic aorto-iliac occlusive disease. The fact that no retrograde perfusion of the body was possible by femoral cannulation proved Leriche syndrome and the necessity of the surgical intervention to perform an axillo-femoral bypass. The detailed visualization of the vascular system in the obtained images allowed for an easy exploration of the vascular system, especially of the modified anatomy, which was impossible to be visualized during a conventional autopsy due to massive fibrosis at the operation sites. It also allowed for analyzing the permeability of all vascular grafts in a way which would not be possible by a conventional autopsy alone. **Conclusion:** This case demonstrates the utility of MPMCTA for the investigation of bodies with suspected vascular pathologies. It proves its advantages over a conventional autopsy in order to investigate modified vascular anatomy; the report presents the first case in which MPMCTA was performed by injecting the contrast-agent mixture into a vascular prosthesis.

A TOOL FOR COMPUTER-ASSISTED VIRTUAL AUTOPSY USING SURGICAL NAVIGATION TECHNIQUES

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Medical image modalities, especially computed tomography (CT) are becoming increasingly more popular as a means to enhance the outcome of medico-legal investigations. However, in our experience, forensic investigators with no or little training in diagnostic radiology often find it difficult to understand the anatomical orientation of axial cross-sectional PMCT images, which is important if the images are used to plan and perform the autopsy. We addressed this issue by developing a computer-assisted system, which allows for quick and intuitive reslicing post-mortem CT datasets directly at the body using a surgical pointing device. Additionally, the system allows for creating screenshots for documentation purposes. **Technique:** The system is based on techniques from the field of computer-assisted surgery and composed of the following parts: a computer system, a surgical tracker, a tracked surgical pointer, a wall-mounted screen and a set of retroreflective markers for body referencing. The workflow to start the navigation process is as follows. First, the body is placed on the CT table and the retroreflective markers are attached to the body. A CT scan is performed and the reconstructed data are sent to the navigation system using the DICOM network protocols. The navigation software automatically detects the position of the attached markers inside the CT dataset and calculates the registration automatically, using the positional data recorded by the tracker. After these calculations, the surgical pointer can be used to define the reslice plane. A line laser integrated into the pointer marks the intersection line of the reslice plane and the body. **Discussion:** The presented system helps to close the gap between forensic autopsy and forensic radiology. In the future, similar systems might prove to be a valuable tool for planning autopsies, demonstrating findings to medical laymen or for teaching purposes.

THE FORENSIC RADIOGRAPHER: A PROFESSION WITH INTERNATIONAL TRAINING AND ACCEPTANCE

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Post-mortem imaging is becoming increasingly more commonly used in the daily routine of medico-legal investigations. The performance of Post-mortem Computed Tomography (PMCT) in medico-legal centers implies a close collaboration between forensic pathologists and radiologists. Additionally, many centers have also integrated professional radiographers that have now become new members of the medico-legal team. These professionals represent a new link between legal medicine and radiology that used to be missing. As the “forensic radiographers” are confronted with particular questions and problems different from those observed in clinical radiology, a specialty training is necessary. Such a training has been initiated in Switzerland, in a project promoted by the School of Health Sciences and the University Center of Legal Medicine in Lausanne. These two institutions have set up two specific programs: one educational program for students and one for graduated radiographers, both starting their first course in 2013. Student courses: To educate future forensic radiographers, we have decided to develop an international program. Therefore, we have initiated an ERASMUS International Module Exchange in Clini-

cal Forensic Radiography. Students participating in this module will stay in Switzerland for 13 weeks, where they will have theoretical courses in clinical radiography, forensic imaging and forensic sciences. They will also undergo practical training at the University Center of Legal Medicine in Lausanne. Additionally, there will be a cultural program permitting them to discover Switzerland during their stay. Postgraduated training: In order to educate forensic radiographers, this training is open to all graduated professional radiographers. It consists of a two-day course held in English, which comprises a theoretical and a practical part. It teaches important information about the basics of legal medicine and the participants learn the application of various approaches to forensic imaging, such as PMCT, PMCT-angiography and 3D-surface scanning. The aim of this presentation is to explain the role of forensic radiographers in the medico-legal team and to inform about training possibilities.

ACCURACY OF COMPUTED TOMOGRAPHY IN ANTHROPOMETRIC ANALYSIS OF HUMAN SKULL AND ITS APPLICATION IN SUPERIMPOSITION TEST

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Introduction: The personal identification based on skeletal remains is the subject of interest of anthropologists, anatomists, morphologists and forensic medicine specialists. One of the most challenging issues in the identification studies is their methodological aspect, since the reliability of the techniques used in the investigations affects the probability of prediction of the individual's antemortem appearance. The aim of the study was to compare the accuracy of the anthropometric measurements of the skull reconstructed with the use of computed tomography with the corresponding measurements obtained from skeletonized skulls by a direct method and to evaluate the usefulness of the CT image of the skull in superimposition test. **Material/Methods:** Ten skeletonized skulls of estimated age and sex were measured according to anthropological standards. The skulls were scanned by multi-slice computed tomography using the 64-slice CT and for every single specimen, a 3-D reconstruction was performed. The images were examined and linear skeletal dimensions were measured. Finally, two sets of the measurements (direct on the skulls and CT-aided) were obtained. The differences between the corresponding measurements were calculated and the statistical analysis was performed. The photographs of the skeletonized skulls were taken and the image of the skull as seen in the photograph was compared with the image of its 3-D reconstruction by superimposition of the images using the Adobe Photoshop software. **Results:** The superimposition of the images showed an adequate level of convergence between the digital images and the conventional photographs. The comparison of direct and digital measurements showed no statistically significant differences between the majority of the direct measurements of the skulls and their analogues measured on their 3-D reconstructions. All the measurements were accurate, comparable and highly concordant in both direct and CT-aided anthropometry. The linear correlation was strong for comparable measurements of the skull and its 3-D reconstruction. **Discussion/Conclusions:** The present paper demonstrates that the use of CT reconstruction of the skull in identification of a non-skeletonized body is relevant and can effectively replace the skeletonized specimen if it is not available for examination. It has been statistically established that the 3D model accurately depicted the original specimen. It has been proven that the 3D reconstruction of the skull is as useful as a skeletonized skull

for the superimposition test. To summarize, the authors present the case, in which the computer-assisted superimposition applied in the comparison was crucial in determining positive identification and it confirmed the two investigated individuals to be the same person.

POST MORTEM 3D CT: MILITARY APPLICATION

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The aim of this study is to analyze the military application of the "virtual autopsy". **Method:** trough a detailed analysis following a review of about 40 reports (clinical reports and military reports) regarding post mortem 3D CT, we focus our study on military application in the Army of the United States, Israel and Germany, especially through the experiences in Iraq, Afghanistan and Balkan areas. **Conclusion:** our study reveals the importance of military application of post mortem 3D CT in combat areas and difficult operative situations. **Key words:** Post Mortem 3D CT 3D, Army, US Soldiers

THE ROLE OF FORENSIC MEDICINE IN THE INVESTIGATION AND DOCUMENTATION OF TORTURE AND ILL-TREATMENT

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In 1948, humanity marked an important milestone with the adoption of the Universal Declaration of Human Rights. One of its 30 articles (Article 5) stipulates that no one shall be subjected to torture or other cruel, inhuman or degrading treatment or punishment.

Since then, there have been a number of other international regulations that have reinforced the legal obligation of states to prevent, prohibit, criminalize and investigate alleged cases of torture or cruel, inhuman and degrading treatment, as well as the obligation to ensure that all perpetrators are forced to answer for their actions and that victims receive appropriate reparation. However, some 65 years later, there continues to be a marked discrepancy between the law and reality. Torture, ill-treatment and detention in terrible conditions continue to occur all over the world, including countries that are generally considered to be paragons of virtue in the sphere of human rights.

This lamentable situation reinforces the need for a more thorough and systematic investigation and documentation of these practices in all countries. Such an investigation and documentation is essential

if we are to eradicate ongoing abuses and prevent new cases and even possible deaths. But thorough investigation and documentation is also necessary to achieve other objectives, such as ensuring that perpetrators are brought to justice, that victims receive proper reparation (compensation, rehabilitation and other forms of rehabilitation to which they are entitled), and that official bodies and the general public are made aware of such practices in order to prohibit them completely or encourage reform.

The investigation of torture and cruel, inhuman and degrading treatment or punishment is not, however, an easy task. Forensic medicine has in this domain a fundamental role and valuable guidelines about how to proceed in the forensic investigation and documentation of such situations have been developed. The Istanbul Protocol is one of the examples. This role of forensic medicine will involve the assessment of possible lesions and signs of abuse, even in the absence of specific complaints or accusations; the documentation of signs of possible physical or psychological abuse; the interpretation of evidence and deduction of possible causes; proffering an opinion as to the extent to which the medical evidence correlates with the specific allegations made by the examinee and/or agents potentially responsible; making effective use of the information obtained in order to thoroughly document and disclose torture practices; ensuring that the legal and governmental authorities and the local and international community are fully informed of the physical and psychological consequences of the kind of torture used. The afore-mentioned role of forensic medicine will also involve an assessment of the detention conditions that, in some cases, can amount to cruel, inhuman or degrading treatment or punishment.

But to investigate and document such cases with the thoroughness that they deserve requires regular expert practice and a continuous effort to remain abreast of new developments through ongoing training, study and reflection. This can provide contact with new torture situations and their physical and psychological consequences, disseminate knowledge of new means of diagnosis and their potential, generate reflection on experiences arising from interventions in the field, and divulge new standards and guidelines.

This lecture will address the several steps and procedures to be followed by a forensic medical expert in the course of fact-finding missions of torture and other cruel, inhuman and degrading treatments or punishments. The difficulties and pitfalls of this forensic medicine mission are presented based on the participation of the author in this kind of fact-finding missions, as a short-term forensic consultant of the UN High Commission for Human Rights.

THE ROLE OF FORENSIC ANTHROPOLOGY IN THE PROCESS OF IDENTIFICATION OF UNKNOWN HUMAN REMAINS

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Forensic anthropology is an applied branch of biological (physical) anthropology concerned with the identification of human remains and associated skeletal trauma related to the manner of death in a legal setting.

The term “forensic anthropology” had been invented in Europe but the field itself was established in the United States in the 1940s. In the 1950s and 1960s, forensic anthropology in the United States became completely professionalized and developed into one of the fields of forensic sciences. However, the term “forensic anthropology” emerged again in the 1970s after the establishment of the Physical Anthropology Section within the American Academy of Forensic Science (AAFS) in 1972.

The American Board of Forensic Anthropology defines forensic anthropology as: „Forensic anthropology is the application of the science of physical anthropology to the legal process. The identification of skeletal, badly decomposed, or otherwise unidentified human remains is important for both legal and humanitarian reasons. Forensic anthropologists apply standard scientific techniques developed in physical anthropology to identify human remains, and to assist in the detection of crime. Forensic anthropologists frequently

work in conjunction with forensic pathologists, odontologists, and homicide investigators to identify a decedent, discover evidence of foul play, and/or the postmortem interval. In addition to assisting in locating and recovering suspicious remains, forensic anthropologists work to suggest the age, sex, ancestry, stature, and unique features of a decedent from the skeleton."

In the United States and Canada, anthropologists routinely participate in all aspects of the forensic analysis of skeletonized human remains, while European forensic anthropology remains primarily within the medical community; nevertheless, the fact is that forensic anthropology is deeply rooted in physical anthropology rather than in medicine. In Bosnia and Herzegovina, medical examiners are officially responsible for anthropological issues and usually the assistance of the forensic anthropologists is not asked for.

Since the dividing line between forensic anthropology and forensic pathology is the presence of soft tissues, therefore, the role of the forensic anthropologist, a specialist in bone examination, can be more then useful and helpful to the medical examiner that is in charge of skeletonized cases or cases involving bodies at various stages of decomposition. The assistance provided by the forensic anthropologist includes aiding in the recovery, examination of human remains with a purpose of establishing the so-called biological profile, analyzing trauma, searching for injuries and tool marks in order to establish a potential cause of death, looking for signs of diseases or other identifying characteristics helping in the identification of the victims, as well as collection of DNA samples. The information about an individual's age, sex, stature and ancestral background can be provided from the remains, which are in an advanced state of decomposition, skeletonized, burned, dismembered or fragmentary.

During the investigation, the anthropologist will conduct a variety of examinations and tests to determine various features to aid in the identification of the victim, identify evidence of trauma which occurred prior to the death and may act as potential identifiers, or identify trauma which caused death. In order to identify human remains, forensic anthropologists apply standard scientific techniques developed in biological anthropology, which are the best suited for the population the examined remains represent.

All the details of the anthropological examination and any other results have to be recorded in a detailed report to be used in further analyses or investigation and potentially in the court, since the forensic anthropologist may be required to stand as an expert witness.

METHOD OF AGE ESTIMATION OF ADULTS FROM LUMBAR VERTEBRAE

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In this presentation, the attendees will be introduced to a new method of age estimation based on changes in the morphology of the lumbar vertebrae. This presentation will make an impact on the forensic community and/or humanity by allowing forensic anthropologists and pathologists to verify and use this new aging method for narrowing age ranges estimation, and, therefore, for more correct estimation of age at death, what is essential in identification of unknown human remains. During the examination of hundreds of skeletal remains exhumed in Bosnia and Herzegovina, the authors found that the pattern of changes observed in the vertebral body can be used as additional indicators for estimation of age at death. The variables that contribute to the overall pattern of changes include (1) the sequence of fusion of the internal rim of the epiphyseal rings to the surface of the vertebral body, (2) the subsequent absorption of the rings into the body, and (3) age-related changes in the superior and inferior edges and surfaces of the body itself. The remains used in this study represented individuals killed during the period from 1992 to 1995 in northwest Bosnia. The remains were exhumed from individual or mass graves between 2001 and 2010. For this study, a series of three vertebrae from 360 skeletal remains representing males of known age were examined. For each individual, the first three lumbar vertebrae

(L1 – L3) were examined. The remains were completely skeletonized. The process of decomposition of the soft tissues and skeletonization was natural and all the examined vertebrae were dry, showing no trace of soft tissue (e.g. free of intervertebral cartilage and periosteum), which allowed for the observation of changes in fusion of the vertebral rings. Three features of the vertebrae bodies were examined: fusion of the internal rim of the epiphyseal rings, changes in the shape of the vertebral body and changes of the texture of the vertebral body. Each vertebra was scored according to the presence and development of those three features occurring with age. In a preliminary study, a comparison of real and estimated ages of the identified remains has shown that age-related changes observed in the vertebral column can contribute significantly to narrowing estimated age ranges, especially for individuals in the age range of 25-45 years, who constitute the majority of the missing persons from Bosnia and Herzegovina. This study will combine different stages for each of three morphological features observed in the lumbar vertebrae in order to develop distinctive phases for age estimation. **Key words:** Age estimation; Lumbar vertebrae; B&H population

IDENTIFICATION OF BURNED HUMAN REMAINS

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Forensic identification of burned human remains is always very difficult; such remains often cannot be identified by conventional means. In such cases, when classical methods are not useful, DNA analysis is usually the only method of choice. DNA analysis is a very powerful method for individualization and identification of skeletal remains and it has been performed in our laboratory for almost 20 years. We will present several cases from our practice involving remains that were badly damaged by fire, what rendered classic identification impossible. We are going to show different kinds of accidents: a plane crash and a car accident, as well as a house fire. Although the remains were highly carbonized, we obtained full DNA profiles from all the typed samples. Therefore, DNA analysis is recognized as the precise and straightforward method of answering the question of identity.

EXPLOSIVE WOUNDS CAUSED BY BOMBS, HAND GRENADES AND MINES – SPECIFIC DIFFERENTIAL DIAGNOSTICS

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Introduction: Explosive wounds caused by shells, mines and bombs account for more than one-half of injuries suffered in modern wars. For example, 85% of the wounds were caused by fragments of explosives in World War II, 90% in the Korean war (1953) and 53% in the Israel-Arab war (1982). Forty-five per cent of victims of all violent deaths (890) were killed by shrapnel and fragments during military activities in Eastern Croatian County Osijek in the year 1991. In spite of a great effort of the Croatian government to clear mine-fields and collect illegally possessed weapons, we are frequently faced with individual and family tragedies caused by detonation of bombs, hand grenades and mines. A relatively high incidence of fatal explosions, 5/100 000 inhabitants per year, is still noted more than twenty years into the post-war period (1992-2012). **Results:** All fatally wounded individuals were analyzed in relation to the location and extent of injuries. In total, 25 victims were killed in consequence of detonation of bombs, hand grenades and mines during the two decades (from 2000 to 2012). Ten

victims committed suicide, eight individuals were killed accidentally and in four incidents, a suicidal perpetrator killed another person. Suicide victims suffered extensive damages over their faces, frontal surface of the trunk and both hands, while the tights, lower legs and feet were spared or sporadically wounded. This specific distribution of injuries was repeated in each analyzed case, indicating that the victim was facing the bomb or was bending over it at the time of detonation. Explosions of concealed mines were a predominant cause of accidental deaths. Farmers, peasants and workers of the task-forces involved in deactivation of mines were among the most frequently wounded people. The unfortunate victims usually triggered detonation of mines fastened to poorly visible pieces of wood or placed on the ground. Devastating injuries repeatedly involved the feet, lower legs, thighs, buttocks and abdomen. In the circumstances of combined suicide-homicide by bomb detonation, suicidal perpetrators and homicide victims were standing or sitting close together. As they were in a close position, similar destructive injuries were distributed over the head, frontal surface of the chest, arms and hands of both victims. **Conclusion:** The location and extent of explosion injuries is of uppermost significance in the conclusion of a fatal incident. A forensic pathologist may be able to assist in reconstructing the event, as the distribution of wounds indicate the relative position of the victims and bomb at the time of explosion.

CVA OR CLSM FOR ESTIMATION OF PMI?

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Introduction: In our in vivo studies of cartilage we have shown that chondrocyte viability changes predictably as a function of time and ambient temperature and this could be used in estimation of post-mortem interval (PMI). The main technologies employed in our studies were based on special staining with the use of a cell viability analyzer (CVA) and a confocal laser scanning microscope (CLSM). **Material and methods:** CVA - The chondral part was split off the osteochondral cylinder, diced to small pieces and enzymatically digested in collagenase II solution. The degraded cartilage samples were washed through a cell strainer and re-suspended in a DMEM/F12 solution. The chondrocyte suspension was treated with trypan blue vital dye included in the kit for automatic dyeing. Viable cells resist dye passage through the membrane, therefore only dead cells are marked intensively blue. The CVA automates the trypan blue vital dye exclusion method for the determination of cellular viability. Dead and living cells were counted automatically. CLSM - 300μm thick cartilage slices were cut out from the osteochondral cylinders. They were stained using the Live/Dead Viability/Cytotoxicity Kit, which includes calcein-AM and ethidium homodimer-1. Calcein is a membrane permeable non-fluorescent substrate that passively diffuses into cytoplasm. After intracellular enzymatic hydrolysis, the remaining calcein is trapped by intact cell membranes and emits a green fluorescence when excited, indicating that the cell is considered viable. Ethidium diffuses through the porous membranes of dying or dead cells and has a high affinity to nucleic acids, and emits a bright red light when excited. Slices were scanned with a CLSM equipped with an argon-krypton laser. The selected location on each slice was 40 μm deep into the specimen and captured by 7 images placed one above another with a 10 μm in-between interval. Micrographs with green and red-colored spots, denoting live and dead cells, respectively, were arranged by the included software. The cells were counted manually. **Results and discussion:** Although CLSM in combination with Live/Dead staining provided the most reliable measurements, technical difficulties (laser microscope scanning, manual cell counting) and the costs do not support CLSM usage in routine forensic work. CVA with automatic cell counting is more user-friendly and reproducible, and it still offers a high level of reliability. **Conclusions:** Determining chondrocyte viability could be a new method for estimation of PMI in the late postmortem period. CLSM provides a slightly superior reliability, but it should be reserved for basic studies and CVA should be used in routine forensic work.

INTRAMUSCULAR HEMORRHAGES IN BACK MUSCLES IN AGONIC DEATH

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Background: During the agony, in selected causes of death (hanging, drowning), the presence of intra-muscular hemorrhages in the back muscles was reported to be probably due to terminal convulsions. In this respect, these findings could provide some evidence that the subjects were alive during hanging or drowning. **Aim:** The purpose of this prospective study was to evaluate the rate of detection of intramuscular hemorrhages in the back musculature in agonic deaths using the back musculature dissection. **Methods:** Eighty autopsy cases were selected (agonic deaths and control cases). The back muscles were dissected layer by layer. The findings were sorted according to the location in six anatomical regions located in the back. **Results:** In the thirty-eight cases in which hemorrhages of the back muscles were found, nineteen victims died from natural causes, five from intoxication, five from traumatic lesions, seven from asphyxia (hanging, drowning or mechanical compression of the thorax) and two from hypothermia. The main findings of this study is that intramuscular hemorrhages in the muscles of the back, as described by Tsokos, are found to be frequently observed even in asphyxia in deaths by hanging or drowning. However, such findings contribute to providing the evidence of vitality of the observed lesions. In addition, we would like to highlight the added value of a systematic histological control of the macroscopically identified hemorrhages to differentiate pre mortem lesions from hypostasis.

POST-MORTEM CONTUSIONS DUE TO FORENSIC EXAMINING OF MECHANICAL EXCITABILITY OF THE MUSCLES – A CASE REPORT

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Soft tissue bruises are considered in forensic medicine as one of the fundamental evidence for a vital character of an injury. Searching for such findings is an important part of every forensic autopsy. Presence or absence of bruises can be a major argument in the evaluation of the final opinion. Therefore, the authors present a case, in which bruises undoubtedly occurred several hours after the death of the victim. The report presents the outcome of a forensic examination of the body carried out by an expert at the scene. A body of the deceased 58-year-old man was discovered in the afternoon in early March, in open area in the Małopolska region. A forensic pathologist evaluated the signs of death of the deceased at approximately 18 p.m. He diagnosed quite well developed rigor mortis of limb's muscles and the jaw, the presence of bluish-purple livor mortis, with localization corresponding to the body position, fading after pressure. The body temperature measured in the rectum was approximately 30° C (with the air temperature of 5° C). Subsequently, the forensic pathologist tested the mechanical excitability of muscle in a typical manner – he used a neurological hammer to hit both arms and both thighs. He reported the presence of myotonic bumps in the arm region, as a reaction to the hit. In two of those areas, within a short period, bruises became visible. Based on the examination, the expert estimated the time of death between 10:00-12:00 a.m. The autopsy of the deceased was performed the following day at the Department of Forensic Medicine, Jagiellonian University. The post-mortem examination revealed the presence of eight oval, red bruises with a brighter area in the middle parts of the arms and thighs, five of whom were accompanied by contusions of the subcutaneous tissue. Histopathological examination of tissue samples taken from these locations confirmed the presence of subcutaneous and even intramuscular hemorrhages. This case shows that in special circumstances, bruises can occur as a postmortem artifact during external examination of the body. **Keywords:** bruises, skin, subcutaneous tissue, vitality signs, postmortem examination

NEW REFERENCE TABLES FOR PREDICTED HEART WEIGHT

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Background: Knowledge of normal heart weight ranges provides important information for pathologists. Comparing the heart weight to reference values is one of the key elements used to determine if the heart is pathological, as heart weight increases in certain cardiac pathologies. Current tables are outdated and were established on different populations. **Aim:** The purpose of this study is to establish new tables relevant to the local population, and to determine the best predictive factor for normal heart weight. We also aim at providing technologic support to calculating the predictive normal heart weight. **Methods:** The reference values are based on a study including 288 adult patients without any obvious pathologies who were autopsied in western Switzerland from 2007 to 2011. The statistically analyzed parameters were age, gender, height, body weight, BMI and body surface area. **Results:** Heart weight is statistically correlated with all of the parameters studied. Body surface area is the best predictor of normal heart weight. **Conclusion:** New reference tables for predicted heart weight are presented, as well a web application that allows for a comparison of heart weights observed at autopsy with the reference values. This application can also calculate BMI and body surface area.

EARLY MARKERS OF MYOCARDIAL ISCHEMIA RELEVANT TO FORENSIC PATHOLOGY: A NOVEL GENE EXPRESSION ANALYSIS SYSTEM COMPLEMENTARY TO IMMUNOHISTOCHEMISTRY

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Introduction: Post-mortem diagnosis of acute myocardial ischemia represents a current challenge for forensic pathologists, especially when death occurs within a short period of time (several minutes to a few hours) after the onset of the ischemic injury. Recent studies have investigated, at the immunohistochemical level, some markers that accumulate in or leak from the human cardiomyocyte after the ischemic event. Nevertheless, these markers are not detectable in the very early phase of myocardial ischemia. In this investigation, we wanted to test, under experimental conditions, the diagnostic potential of some immunohistochemical markers for the detection of early myocardial ischemia. Among them, we investigated: troponin I and T, myoglobin, fibronectin (total and tissular), tenascin C, C5b-9, connexin 43 and Jun B. The same and additional markers (such as HIF-1 alpha, caspase 3, 8 and 9) were studied at the gene-expression level as well, using the NanoString nCounter® gene-expression system. **Materials and methods:** A rat model of myocardial ischemia (ligation of the left anterior descending coronary artery, LAD) was used. The immunohistochemical and gene-expression investigations were performed on the ischemic myocardium at different time points after LAD ligation, ranging from 5 minutes to 2 weeks. As a comparison, hearts from control and sham-operated groups were investigated by the same methods. The NanoString nCounter® is a novel gene-expression system, which allows for direct measurements of mRNA expression levels without enzymatic reactions or bias, with a sensitivity coupled with high multiplex capability and a digital readout. **Results:** The earliest expressions following myocardial ischemia were observed for JunB (15 minutes) as well as for apoptosis and hypoxia markers (15-30 minutes), followed by total fibronectin (≤1 hour), C5b-9 (≤1 hour), myoglobin (≤1 hour), troponins I and T (≤1 hour).

The latest markers, expressed only in the healing phase of myocardial infarction, were tissular fibronectin and tenascin C. Conclusions: We have identified, by means of immunohistochemical and gene-expression investigations performed in a purely experimental model of myocardial ischemia, early markers of ischemic injury as JunB and apoptosis effectors, expressed as early as 15 minutes after coronary artery ligation in rats. Moreover, we have confirmed the early expression of total fibronectin, C5b-9, myoglobin and troponins (≤1 hour). We have, therefore, identified a panel of markers to be further applied in routine forensic practice in order to improve the diagnosis in the challenging cases of sudden cardiac deaths.

FREQUENCY OF CLASSIC AND STIMULANT-TYPE DESIGNER DRUGS AMONG SUSPECTED DRUG USERS IN CSONGRÁD COUNTY (HUNGARY) IN 2012

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Introduction: The aim of the present work was to obtain a real picture of the frequency of stimulant-type designer drug consumption in Csongrád county (South-East Hungary) in 2012. Urine and/or blood samples of suspected drug users taken by the police were analyzed for 16 classic illicit drugs, 10 psychoactive substances and 42 stimulant designer drugs. **Method:** The analysis was performed in samples collected from 332 persons (urine: 328, blood: 27) by GC-MS without immunological prescreening. **Results:** In the population investigated, 201 men (60.5%) and 27 women (8.13%) (total: 68.7%) were positive for at least one substance; the average age of the positive cases was 26.8 years. Similarly as in the preceding years, THC was the most frequently used illicit drug (124 positive samples, 37.4%), followed by the classic amphetamines (52, 15.7%), illicit opiates (10, 3.01%), medical opiates (10, 3.01%), and cocaine (5, 1.50%). 111 persons (33.4%) were positive for stimulant-type designer drugs, among which penthedrone showed the highest prevalence (72, 21.7%), followed by 4-fluoro-metamphetamine (4-FA, 7 cases, 2.11%), 4-methyl-amphetamine (4-MA, 6 cases, 1.81%), mephedrone (4-MMC), 3-fluoro-amphetamine (3-FA), and 2-methylamino-1-phenyl-1-pentanone (APVP) (4-4 cases, 1,24 % of each). The measured prevalence of benzodiazepines was 163 (49.1%), among which clonazepam (35, 10.5%) and alprazolam (26, 7,83%) showed the highest frequency. **Discussion:** Until the end of 2010, mephedrone was the "leading" stimulant-type designer drug on the Hungarian black market, but after it was entered into the list of illicit drugs, its frequency dramatically decreased. Among the 42 stimulant-type designer drugs seized by the police until April 2013, penthedrone was the most frequently used in Csongrád county in 2012. The majority of drug users were male (60. 5%) at an average age of 27 years. In the majority of cases, designer drugs were present in combination with each other, or with illicit and licit drugs, what can lead to more severe toxic effects than when they are used singly.

PRELIMINARY RESULTS OF POST-MORTEM MEASUREMENTS OF 3-BETA-HYDROXYBUTYRATE IN LIVER HOMOGENATES

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Introduction: The detection of drugs in samples collected during autopsy can be challenging as compared to clinically derived specimens. The presence of putrefactive compounds and the decomposed nature of the samples limit the direct applicability of clinically validated assays in a post-mortem setting. Tissue samples obtained from the liver are often used in post-mortem toxicology analysis in case of

blood unavailability. The aim of this study was to investigate beta-hydroxybutyrate levels in blood and liver samples in a series of medico-legal autopsies that included cases of diabetic ketoacidosis and bodies presenting decompositional changes. **Material and methods:** The concentrations of beta-hydroxybutyrate in femoral blood and two liver samples were retrospectively examined in a series of medico-legal autopsies (48 cases) including diabetic ketoacidosis (8 cases), non-diabetic individuals presenting with moderate to severe decompositional changes (20 cases) and non-diabetic individuals without decompositional changes (20 cases). The objective was to characterize beta-hydroxybutyrate concentrations in two liver homogenates in comparison to blood levels, as well as to evaluate the usefulness of beta-hydroxybutyrate determination in liver samples in order to quantify the metabolic disturbances potentially leading or contributing to death. **Results:** Beta-hydroxybutyrate concentrations in liver sample homogenates correlated well with blood values. Additionally, decompositional changes were not associated with increases in liver beta-hydroxybutyrate levels. **Discussion and conclusions:** Preliminary results suggest that beta-hydroxybutyrate can be reliably measured in liver homogenates when blood is not available at autopsy. Furthermore, these findings suggest that metabolic disturbances potentially leading or contributing to death may be objectified through liver beta-hydroxybutyrate determination even in decomposed bodies.

A CASE OF SUICIDAL INSULIN OVERDOSE – SIGNIFICANCE OF DIRECTED TOXICOLOGICAL AND HISTOPATHOLOGICAL STUDIES FOR MEDICO-LEGAL OPINION

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Introduction: The interpretation of insulin levels in the post-mortem biological material is very difficult. The number of published papers dealing with this problem is relatively low. The time of survival after insulin injection depends on many different factors and certainly influences the insulin levels detected in the post-mortem material. Unfortunately, in the forensic practice, we usually do not know that time, because the cadavers not infrequently are found after a long time since death, for example when the victim lived alone. Additionally, insulin determination in post-mortem blood, mainly because of ongoing thanatochemical processes, has a low diagnostic and testimonial value. **Case presentation:** A case of a 44-year-old non-diabetic man, who was found dead lying on the bed in his flat, is presented. Near the body, an ampoule and syringe were found and secured for further analysis. Two days earlier, the man had called his wife and said that he was going to commit suicide. The autopsy did not reveal the cause of death. The initial stage of putrefaction, blood fluidity, acute blood stagnation in the internal organs and two puncture marks on the right thigh, which might have been injection sites, were found. The standard toxicological analysis disclosed no evidence of drugs or alcohol, so, in keeping with the suspicion of suicide by insulin injection, a directed analysis with immunoradiometric assay (IRMA) was conducted. It revealed a high insulin concentration level in the vitreous humor (24.42 μIU/ml) and the presence of insulin in the material secured at the crime scene. All these analytical results, in addition to low amounts of glycogen in the liver (evaluated by the Periodic Acid-Schiff staining) confirmed insulin overdose. **Conclusion:** In cases where suicide by insulin poisoning is suspected, determination of its concentration in the vitreous humor and non-biological material using the IRMA method gives the opportunity, similarly as the LC-MS/MS analysis, of objective confirmation of the poisoning. An analytically confirmed higher level of insulin in the vitreous humor plays an important and even a decisive role in structuring the final medico-legal opinion about the cause of death. A detailed histological examination, especially of the

liver, aiming at detection of morphological symptoms of hypoglycemia, should be always performed. The vitreous humor should be routinely collected and analyzed during autopsy in every case with an "insulin" background.

A REVISION OF MISTAKEN INTERPRETATION OF EXPERT REPORT IN A CASE OF ACUTE RADIATION SYNDROME IN AFFECTED WORKERS AFER AN INDUSTRIAL ACCIDENT

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We present a case of an industrial accident, in which a container with radioactive waste exploded in consequence of a human error. Five workers were affected; all the victims developed acute radiation syndrome. The victims were initially treated at the Military Hospital in Sofia and then were transported for continued therapy to France. The oldest victim was 75 years old and suffered from preexisting diabetes mellitus; the patient manifested arrhythmia and therefore had a pacemaker implanted. After intensive treatment in France, when their lives were no longer at risk, the patients were transported back to Bulgaria and again hospitalized at the Military Hospital in Sofia. Four of the affected workers survived and fully recovered, but the oldest patient with pacemaker died. At the autopsy, according to the involved forensic pathologist, evidence of myocardial infarction was found; thus, he concluded that the cause of death was not related to the industrial accident. Under Bulgarian legislation, there were five workers exposed to temporary danger to life as a consequence of their developing acute radiation syndrome. A controversial issue was the fifth victim who died. We were appointed to a forensic examination board consisting of medico-legal doctors, a pathologist, radiologist and hematologists. Despite of the professional dispute concerning the association between the myocardial response due to prolonged severe ischemia and radiation loading during the body`s exposure, after a careful analysis of all medical records and histological examination slides, we inferred that - as a result of radiation and increased permeability – the victim developed acute coronary circulatory disorder which, when combined with preexisting diabetes, led to death. Our expert standpoint was opposed to the originally given opinion. Namely, we believed there was a direct and continuous causal relation between the accident and death of the victim. Thus, an incorrect conclusion to be pronounced by the prosecution was prevented and a crime associated with a loss of life of one of the victims was disclosed.

RIOT CONTROL AGENTS, IS IT SAFE AND IS IT LEGAL IN CONTEMPORARY CASES, SUCH AS IN TAHRIR SQUARE OR OCCUPY WALL STREET DEMONSTRATIONS

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The employment of toxic chemicals, such as pepper spray or tear gas, by security forces during violent confrontations and in armed conflict continue to be a source of legal and political uncertainty and concern.

There is concern that riot control agents (RCAs) and incapacitating agents (ICAs) are or could be misused as a method or warfare or for hostile purposes. On 19 November 2011, a disturbing video of Occupy Wall Street protesters at University of California, Davis, getting pepper sprayed by the police while passively sitting on the ground made the rounds on the Internet. The day after, the news' focus was on the Egyptian police firing tear gases at Tahrir Square demonstrators. The most dramatic example is the 23 October 2002 domestic use of toxic chemicals by Russian security forces when they used

a fentanyl derivative against some 50 Chechen terrorists who had taken approximately 800 hostages at the Dubrovka Theatrical Centre in Moscow.

As a result all the terrorists were killed, but at least 125 hostages died from the effects of the gas. What we know about RCAs It is widely claimed that RCAs have higher safety ratios. However, it is not always the case for two reasons. First, RCAs must act quickly before targets can react with defensive or offensive action, for this reason RCAs are used in higher doses. Secondly, like any other pharmaceutical agent, a population shows a considerable variation in sensitivity to RCAs effects, such as asthmatics or sickle cell trait patients. So vulnerable people may suffer from permanent injuries as well as may die with much lower doses of RCAs compared with general population. RCAs, such as CN, CS and OC, have been shown as contributory factor in some lethal cases.

What needs to be done? It has been shown that RCAs have been contributory factor number of deaths since 1960s. In order to have greater understanding the mechanism of deaths caused by RCAs and also for preventing more deaths, detailed autopsy guidelines should be applied on the suspected deaths. Although Minnesota Protocol (Model Protocol for a legal investigation of extra-legal, arbitrary and summary executions) can be used for these cases, improving a new and unique protocol will be more appropriate. Forensic medicine should play a central role in the analysis and prevention of death or injuries caused by RCAs.

A LECTIO MAGISTRALIS IN POLICE DEPARTMENT: THE SERIAL KILLER – TO BE OR NOT TO BE?

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The aim of this study is to analyze the behavior of serial killers from the perspective of criminology. **Method:** through a detailed analysis of two important models of Italian killers, two polyhedral paradigms, we followed the "red line" that begins at the hypothetical pattern of a serial killer, but ends with different patterns of the two analyzed criminal minds. **Conclusion:** our study reveals real difficulties faced by the policemen during their fight against criminal subjects and different variations of the criminal mind that entail an improvement and new mental horizons for detectives employed by the Police Department. **Key words:** Killer, Paradigm, Criminal Minds, Police, Detective

CO-MORBIDITY WITH SEXUAL ASSAULT: A CASE REPORT

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Co-morbidity or the co-occurrence of mental disorders and substance use disorders is common among victims of sexual assault, but occasionally, life threatening conditions have been observed in these patients, which need immediate medical attention. A 7-year-old girl was referred from a health care center to Sinawe with a history of sexual assault by an unknown male having occurred 4 days previously. She was threatened with death in case of disclosure. Her aunt suspected some incident must have happened as her gait was abnormal. Then the girl opened up and recounted the entire incident. She presented with vaginal discharge, vomiting and diarrhea along with mild fever. She was also depressed. On physical

examination, genital injuries with a hymen rupture were confirmed. She presented with abdominal muscle guarding. The patient was referred to a pediatrician at the Nelson Mandela Academic Hospital for exclusion of any morbid condition. The girl was refused admission as she was labeled a victim of rape, but persistent persuasion of the Sinawe Staff resulted in her being admitted and later on operated on for acute appendicitis.

PALM OF HANDS, A NEW CLINICAL SIGN DURING MEDICO-LEGAL EVALUATION OF FATAL FLAME BURN INJURIES

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The present prospective study was performed on 221 cadavers who were victims of burns, including those that died at the scene (8/221), among them two victims with non-vital burns (post mortem burns), and those deceased as inpatients (213/221). Those cadavers were examined and dissected in the Sulaimaniyah Medico-Legal Institute from May 8, 2008 to May 7, 2009, following complete medical history taking from relatives, interviewing responsible police station registration officers and obtaining data registered by burn centers. The age, sex, occupation, marital status and place of burn were taken into consideration in order to determine the distribution of age, sex, social status and specific geographical distribution. In general, the victims were either received from the scene after an average period of 2-4 hours following the event, or directly from hospitals. Predictions of the mode and manner of death based on primary information obtained from the families of the victims and from police registration officers were followed by the final manner of death determinations based in each case on the ruling by the court and prosecutor. Deaths from burns have been remaining at the top of the police list of casualties for the last 5 years in the Sulaimaniyah Medico-Legal Institute. • Young age was associated with higher mortality rates as compared to other age groups, what points to the most active stage of life, and the ratio of females to males was 6.4:1. • Housewives and girls accounted for more than 60% of deaths. • The incidence of burns showed a higher rate in rural as compared to urban communities and the ratio was 4.1:1. • More than 23% of suicidal burns involved students of intermediate and secondary schools. • Kerosene as a causative burn agent accounted for 86.4% of cases. • The manner of burns as revealed by family interrogations was 74.7% accidental and 25.3% suicidal, which means that suicidal burns represented one-quarter of deaths. On the other hand, the manner of burns as disclosed by police investigations, court and prosecutor decisions was 71.5% accidental, 27.6% suicidal and 0.9% criminal. • A part of the palm of the hands remained intact in all suicidal burn cases, while the palms were destroyed in all accidental burns.

HONOR CRIMES

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A man in charge, mostly the brother or the father, performs the act of killing based on an illegal relationship with a female in the family. According to a retrospective study done by a team from the Ministry of Human Rights and the Medico-Legal Institute in Baghdad, 2334 victims were killed in the past three years in consequence of honor crimes (including crimes exacted for revenge of honor). Numerous presentations demonstrate the manner of committing homicide under the name of honor crimes: classic cases, claiming loss of virginity, delayed crimes, concealed crimes.

TO DIE TOGETHER

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Introduction: In the praxis of forensic pathologists, we sometimes meet with the cases of mutual deaths or deaths that are somehow linked together. In this work, we present three cases of common deaths, when the perpetrator of homicide committed suicide within a short time after his malefaction. **Methods:** We present three unusual cases of duplex violent deaths, which are special not because of the category or cause of death, but due to unusual circumstances that showed that in all of these cases, the perpetrator of a murder killed himself too - in one case, in a different manner and in two of these cases, in the same or similar manner he had used while murdering his victim. **Casuistics:** The first case focuses on a man who inflicted multiple stab wounds with a knife on his girlfriend and caused her death due to hypovolemic shock. In total, she had 19 knife wounds of the chin, neck, upper extremities, thorax and dorsum. After her death, the perpetrator committed suicide by crashing his car against a concrete wall. The second case describes a Bulgarian couple which was found hanged in their garage. The circumstances at first suggested that it was a common simultaneous suicide; however, the precise external and internal examination of the corpses during the autopsy showed that the woman was murdered by her husband, who then completed the violent crime by his own death. The last case deals with a married couple that did not live together; the husband shot his wife while she was walking their dog and then turned the short arm gun against himself. **Results:** These three cases of common violent deaths were chosen to point out at the silent violence around us. In all of these cases, the violent crime was committed against the nearest person; however, in all of these three cases, the homicide was followed by remorse that led to suicide. **Conclusion:** The aim of this work was to demonstrate three different stories of joined deaths – the first one showed stabbing followed by a car crash suicide, the second one dealt with a simultaneous hanging that turned out to be a homicidal hanging followed by a suicidal hanging, and the last one focused on a homicide-suicide attack with a short arm gun involving a married couple. By choosing these three cases we want to point out at desperate situations of certain individuals that eventuate in mutual death – a homicide followed by suicide.