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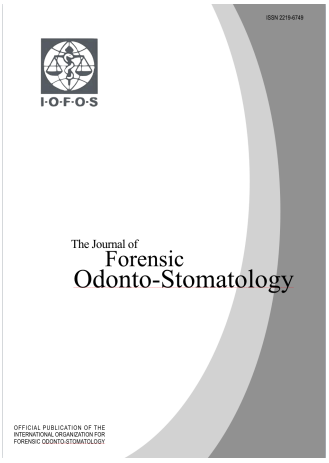

THE JOURNAL OF FORENSIC ODONTO-STOMATOLOGY

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EDITORIAL

by Vilma Pinchi – Editor of the Journal of Forensic Odonto-Stomatology

The Triennial IOFOS International conference took place in Leuven, 13-15 September 2017, and presenters and attendees from more than 40 Countries attended the conference, thus confirming that IOFOS symposia continue to represent the most important scientific events in the field of forensic odontology in the world. Scientific sessions were dedicated to very actual topics as the immigration flow towards Europe, age estimation in unaccompanied children, reports about the identification issues related to the most recent disasters and terrorist attacks and bitemark analysis and its questioned relevance in Court. About 10 keynote lectures, more than 45 oral presentations and 70 posters fostered the conference and contributed to meaningful discussions during the sessions and even in the breaks between sessions. The many presentations encompassed scientific researches, discussion papers and case reports and well-known academics, extensively experienced odontologists, young students and professionals went on stage. This supplementary issue of the Journal of Forensic Odonto-Stomatology (JFOS) is dedicated to collect the abstracts of oral presentations and posters accepted at the IOFOS Conference, Leuven 2017. The affiliations and email contacts were released by almost all presenters and are included in the abstracts; this will facilitate contacts and networking and hopefully could lead to a meaningful prosecution of some joint researches. The supplement will not include the presentations related to the updating procedure of the IOFOS Guidelines on Quality assurance, since it is a separated ongoing cultural process and will be appropriately presented as soon as the revision procedure of the guidelines will be completed. The issue 2- 2017 of the Journal will be published online soon and it will collect the full-texts of those presentations that were submitted to the Leuven meeting and accepted for publication after a blind revision process. The conference in Leuven was very successful and the IOFOS Board and the current Editor of the JFOS hope that the effort put in the publication of the full-text papers, mainly thanks to the former Editor of JFOS and organizer of the IOFOS conference in Leuven, Prof. P. Thevissen, and the supplement that gathers all the abstracts, will contribute to the scientific advancement and to establish contacts inside the worldwide forensic odontology community.

I·O·F·O·S

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CONTENTS

POSTER PRESENTATIONS

Migratory flows across Mediterranean : new challenges for forensic sciences

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ORAL PRESENTATION

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ABSTRACT

The immigration flow towards European Countries is a well known phenomenon that has impressively increased in the last few years. The current data tell us that Greece with more than 160 thousand alone this year and Italy more than 98 thousand immigrants have arrived from the East and Northern Africa. Looking at the reasons behind such a massive migration flow, no evidence was found to support the idea that large numbers of people are leaving their countries with the intention of reaching Europe. Local migration creates specific risks as that smuggling operations develop into trafficking, once migration has begun.

Several people reported that they had left without informing family members in their countries of origin, for fear that they would try to prevent them. This fact creates specific difficulties in retrieving and contacting families for identification purposes.

The most important issues addressed by the presentation are related to dead bodies. In these cases forensic experts are required to provide the typical forensic activities addressed to establish the causes of death, the possible occurrence of crimes and to identify the body. DVI Interpol procedures ought to be applied as usual: primary identifiers (DNA, Fingerprints, Dental Data) and secondary identifiers must be collected from bodies (PM) and from missing persons (families, relatives, medical and dental files, etc) for antemortem data. Then Postmortem and Antemortem data can be compared and reconciliated and bodies can be identified and released for burying. Identifications based on visual recognition or personal belongings are considered unscientific and should be avoided, but in practice several limitations obstruct such a fair and scientifically sound procedure.

For living migrants in most cases no legally valid documentation is available so identification must be provided for instance in cases of crimes. Moreover we have issues connected with age estimation for children and medical evidence of torture or violence on adults and the requirements for children to obtain the refugee status or subsidiary Protection status. The age assessment emerges as very relevant for the minor that applies for national or international protection, but from forensic and medico-legal point of view, the EU regulations specify nothing about the procedure to be applied to assess the age of the minor, the legal rules and the possible justification of the methods based on a radiological examinations of children. In practical cases some relevant questions often arise about the type of lies that we can expect

regarding age. Secondly does a pure chronological age assessment offer enough protection for the recently arrived subjects?

For asylum seekers the key-point of a discussion, focused on forensic and medico-legal issues, is related to procedure recommended to ascertain if asylum seeker was a victim of violence or torture. The Istanbul Protocol adopted by the United Nations in 1999, sets out international standards for states, health and legal professionals, on the investigation and documentation of allegations of torture and other ill-treatment. For a medico-legal or forensic expert providing an opinion is a real challenge for several reasons. First physicians are not acquainted with the physical evidence of torture and the different techniques used in different areas of the world.

As usual Education and qualification are the most appropriate final recommendations to face new challenges, but in this case forensics at large seem well prepared to deal with forensic and medico-legal issues raised by massive migration flows better than the political assets seem to be.

20 Years Anniversary of the Chair of Forensic Dentistry at University of Zagreb, 1997 . 2017

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ORAL PRESENTATION

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ABSTRACT

Chair for Forensic Dentistry at the School of Dental Medicine University of Zagreb was founded in 1997 as a result of abundant experience gained during the identification of the victims of the Homeland war in Croatia (1991-1995), education at the Karolinska Institute in Stockholm (1994), and with the support of the head of the Department of Dental Anthropology (professor Zvonimir Kaić at the time), and the Dean of the School of Dental Medicine (professor Vjekoslav Jerolimov at the time).

According to the current trends in the forensic sciences, the dental school curriculum was changed in a way that the subject "Forensic medicine and criminology" was substituted with "Forensic dental medicine". The subject had 30 hours of teaching, and was based on the guidelines of Scandinavian and American schools with local (Croatian) experience.

From the founding until today, the Chair is led by the same person (professor Hrvoje Brkić), but during the twenty years it was enriched by three more teachers (Assistant Jelena Dumančić in 1999, Assistant Marin Vodanović in 2005, and Assistant Ivana Savić Pavičin in 2012). Visiting professor Tore Solheim from the University of Oslo took part in the education of the whole staff from 2008 until 2012. Today, the Chair and its teachers take part in three study programs: integrated undergraduate and graduate program Dental medicine, postgraduate specialist program and postgraduate doctoral program. Courses and trainings in forensic dental medicine is a part of a lifelong learning of doctors of dental medicine. Scientific and publishing activities of the Chair are based on scientific projects and include identification techniques, dental profiling and expertise in dentistry. Founding of the Croatian Association of Forensic Dentists 20 years ago and the activities of the staff had contributed to the international recognition inside the International Organization of Forensic Odonto-Stomatology.

The presence of the Chair for the last 20 years was proven as needed in the education of dental medicine students, their graduation theses, and in solving cases from the field of forensic dentistry as well.

Forensic Odontology education: from undergraduate to Ph.D. – a Brazilian experience

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ORAL PRESENTATION

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ABSTRACT

Background: Forensic Odontology is a topic present for the majority of Dental Schools in Brazil, and, due to this reality, some universities develop activities related to undergraduate and graduate students, since the Dentistry course until the Ph.D. degree.

Objective: present the education experience related to Forensic Odontology at School of Dentistry of Ribeirão Preto (USP - University of São Paulo), showing the strategies and activities in the different degrees (Dental course, Forensic Odontology Specialization Program, Specific Professional Training, Master, and Ph.D.).

Results: to the undergraduate students, many activities are developed in order to demonstrate all the possibilities that Forensic Dentistry allow, including theoretical and practical activities; in the Forensic Odontology Specialization Program, the dentists are trained to act as Forensic Odontologists in all its amplitude; in the Specific Professional Training, some courses are available related to specific topics as DVI, Forensic Facial Reconstruction, Auditor in Dental Care Insurance and others; and in the Master and Ph.D. Programs, the professionals receive training in skills like teaching, research, student's guidance and others.

Conclusion: In Brazil, Forensic Odontology is a well know field in Dentistry and universities develop an important role in training a qualified workforce.

The Statistical Analysis on the Forensic Odontological Examination at the National Forensic Services from 2011 to 2015

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ORAL PRESENTATION

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ABSTRACT

Forensic odontology is a branch of dentistry applying dental knowledge to criminal and civil laws for the purpose of maintaining public order and treating legal issues in association with dental evidence. The National Forensic Service (NFS) is a Korean government agency responsible for the examination and evaluation of evidences at crime scene. The Section of Forensic Odontology of the Medical Examiner's Office in NFS is performing forensic odontological analysis of human remains. This study statistically examined overall forensic odontological cases referred to the NFS from 2011 to 2015. After then the results were compared with the previous study (2011), which examined the cases from 2007 to 2010 in an attempt to figure out the trends of practical cases in forensic odontology and the future direction for the research.

A total of 588 forensic odontological cases were commissioned to the NFS between 2011 and 2015. The numbers of requests per year were similar to the past, and the highest in April and September of each year. In terms of regional origins, the proportion of total number of the requests (54.9%) was the highest in the metropolitan area. However, the proportions in other regions (Gyeongsang Provinces, Jeolla Province etc.) were being increased when compared to the previous study. In referral routes of the cases, the majority of the requests (77.0%) was occurred in intra-NFS (further dental examinations after the autopsies in the NFS) rather than direct requests from police agencies. This tendency appeared to result from the overall increasing autopsy numbers in South Korea. In terms of the areas of practice, postmortem biological profiling including age estimation occupied absolute majority proportion of the overall requests (94.0%), which were more increased from the past, while dental identification (3.4%) and bitemark analysis (0.9%) tended to decrease. The results from this study will be an important reference material for the study and training of the forensic odontology in the future.

A roadmap plan of developing forensic odontology in UAE

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ORAL PRESENTATION

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ABSTRACT

The aim of this presentation is to update the forensic dental and medical community on the recent Forensic Odontology (FO) developments in United Arab Emirates (UAE). The vision is to recognize and integrate the new field of FO into current forensic medicine and science and to implement the strategic roadmap plan which was presented at International Academy of Legal Medicine (IALM) conference in Turkey 2012. The roadmap plan aimed to apply FO using accessible recourses such as a forensic evidence lab and a morgue specifically to investigate dental evidence. The focus lies on the major subspecialty of FO which are dental identification, bite-mark investigation, dental age estimation and dental litigation.

The paper of Derek Clark published in 1986, identified some obstacles during the human identification of the Air Gulf crash flight 2P6-737 victims (112 victims, 26 of them children) in Abu Dhabi desert. He concluded that dental identification was of only limited application anticipating flight 2P6-737 victims. Moreover, in UAE dental age assessment was done using clinical evaluation only and bite mark cases have been proven by pathologist just in a descriptive way.

Dental evidence management in UAE started emphasis on reporting, analyzing and referring as reference to best practice cases according to standardized protocols (E.g. International Organization of Forensic Odonto-Stomology (IOFOS) and American Board of Forensic Odontology (ABFO)). The case assessment implemented scientific research knowledge obtained at Katholieke Universiteit Leuven (KULeuven). UAE employed multidisciplinary forensic medicine and science collaborations nationally within Emirates' country and internationally since its active membership of Forensic Odontology Scientific Working Group in Interpol DVI. The Working Group helped in reviewing and updating odontology quality assurance forms and procedures.

A vision of developing Forensic Odontology has been presented in a deliberate roadmap plan. Challenges anticipated by culture and time were overcome in an effort to deliver and apply the plan. Initially, recognition of Forensic Odontology as a specialty, was accomplished through official entities such as ministries of education, health and interior. Thereafter, knowledge and awareness have been increased by anticipated teaching and training such as education at Rabdan Academy state of the art facilities for forensic strategy development and evidence management.

Components of the strategic roadmap plan for Forensic

Odontology were achieved such as the establishment of a specific, validated UAE (Arab Ethnicity) dental age estimation database which makes a better scientific technique to be used systematically and legitimately. A UAE DVI team with an Odontologist on board was activated for the first time in Air Asia crash flight QZ8501 in Indonesia. Bite mark analysis was considered as a major evidence that required a specialist in the field for a suspected child abuse and neglect case in Dubai Police (UAE). Participation in the medical litigation committee, which involved dental liability claim activity to identify the risk factor in dental practice, has been stressed and promoted. The strategic plan presented at IOFOS, would be applicable to countries with underdeveloped Forensic Odontology specialty to provide crisis preparedness and secure environment similar to UAE roadmap model.

The changing role of the Forensic Odontologist

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ORAL PRESENTATION

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ABSTRACT

The role of the Forensic Odontologist varies around the world. Changes in the role of the Forensic Odontologist in Western Australia over time are identified in a review of 27 years of case work. Suggestions are made for changes to the structure of training curricula for Forensic Odontologists as a result. The review considered the number and type of dental examinations requested relative to the Forensic Pathology case-load, the physical condition of the deceased as well as outcomes. Variation in the requests for Forensic Odontology services around the world is briefly discussed

II CIDEM: a big training in mass disaster for Olympics Games Rio 2016, in Brazil, Phase 01 INTERPOL

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ORAL PRESENTATION

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ABSTRACT

The CIDEM Project (Congresso Internacional de Desastres em Massa) started at the Community Laboratory Extension Program (PROLAC), in Health Department of State University of Feira de Santana (UEFS) -Bahia-Brazil, in 2014. The CIDEM Project promove military and civilian forces that act in disasters integration, as well as the professional and population qualification in Mass Disasters cases. With experiences exchange in national and international levels, it brings the academic reality closer to the daily reality of professionals who study, train and act in disaster situations. The Second CIDEM, was a Big Meeting in Mass Disaster promoved by UEFS. The aim of this paper is to report the training in DVI Phase 1 INTERPOL, held in Salvador city, Bahia, June 10-12, 2016 at the Arena Fonte Nova soccer stadium, with theme "SECURITY FOR GREAT EVENTS - A WORLD WARNING". The aim of the II CIDEM was to integrate agencies involved in mass disaster cases; Train teams and agencies of the country in matters related to Mass Disasters and Prepare the forces of the states that hosted the Olympic Games RIO 2016. The event brought together 2000 people, 1,500 were on the scene and 32 agencies were present. A bombing atack simulation occurred, leaving hundreds of victims dead. The agencies carried out their actions, having, in the end, the action of the DVI team. In this way contributed to the preparation of Brazil for the 2016 Olympic Games.

The versatile use of free-to-download and open access computer software in forensic odontology casework

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ORAL PRESENTATION

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ABSTRACT

Development of new computer hardware and software in the last 15 years has radically altered the way dentists approach to forensic odontology casework. However, many of these developments are still out of reach of most dentists in emerging economies owing to economic factors. This oral presentation details how a free-to-download and open source software application named GIMP ('GNU Image Manipulation Program') can assist dentists in diverse forensic odontological analyses, including child and adult age estimation, bite mark investigation, and sex assessment. The author has no vested/financial interest in this software. The intention is not to recommend this software in particular, but to highlight the techniques and steps involved (which may be similar to other free software applications) but are hitherto unexplained in detail. At approx. 75 MB, GIMP is easy to download and install in basic desktop/laptop computers. Using just one tool available in GIMP (viz., the 'Measure Tool'), the open apex method can be used on radiographs of children to measure the width of the developing apical portion of the tooth, the tooth height, calculate their ratio and estimate the age. Similarly, the 'Measure Tool' may also be used to assess the mesiodistal and buccolingual dimensions of teeth on two-dimensionally (2D) scanned skull specimens for sex assessment. Another use of the 'Measure Tool' is calculating the length of root dentinal translucency on 2D scanned images of 250 microns thick tooth sections for adult age estimation. In addition, using tools such as the 'Fuzzy Select Tool', root dentinal translucency can be delineated to calculate translucency area for estimating age on similar scanned tooth sections. On dental radiographs imported to the software, the 'Free Select Tool' can be used to select the outline of the tooth and outline of the pulp/root canal. The number of pixels within these selections can be viewed on the Histogram dialog and their ratio calculated to estimate age in adults using the pulp-to-tooth area ratio. Lastly, the software program can also be applied to 2D bite mark analysis. This includes proper orientation of the close-up bite mark photograph using the 'Measure Tool' and 'Rotate Tool', correcting it for minor photographic distortion using the 'Perspective Tool', confirming that distortion is corrected using the 'Ellipse Select Tool' and Stroke Selection, and life-sizing the photograph using Scale Image; once these steps in processing the bite mark image is completed, the incisal surface/bite edges on the 2D scanned casts of the suspect's dentition are outlined with the

'Free Select Tool' and stroked on a new layer. The stroked bite edges (the so-called "hollow volume overlay") can be copied and pasted (as a New Layer) on the life-sized bite mark image and then superimposed on the bite mark using the 'Move Tool' and 'Rotate Tool'. Thus, GIMP has the potential to serve as an excellent tool in the armamentarium of dentists involved in routine or occasional forensic odontology casework.

M3C mobile management of mass casualties

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ABSTRACT

Background: In mass casualty disasters and humanitarian emergencies, the handling of human remains is a critical and sensitive operation.

Methods: The authors developed a mobile application and portable forensic kit for collecting and managing reliable post-mortem information for identifying human remains.

Practical implications: The mobile application is designed in such a way that even non-forensic volunteers with minimal training can use it in remote and dangerous locations where it would be hard to deploy forensic teams and equipment. The app efficiently creates a secure and accurate record of basic post-mortem information like location, physical description, personal affects, and photographs. The collected data can be easily uploaded to a central database, which other agencies can securely access to aid in identification.

Dental AM data management in DVI

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ORAL PRESENTATION

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ABSTRACT

Data management is of extreme importance in DVI operations. Of these data the gathering of dental AM information in particular is outmost important, but at the same time the most challenging as all involved in DVI know there will different challenges, pitfalls and difficulties. Locating the dentist, obtaining the dental records, transferring and transcribing these records are just some of the challenges. A strict protocol for the management of AM dental data is absolutely necessary and will be discussed. An overview of dental AM information to be collected and how it can used in DVI will be given.

Dental radiographic matching – A comparison of practitioner performance using a forced decision model, ABFO, DVISYS and Interpol Identification Scales

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ABSTRACT

The aim of this study was to assess the accuracy of antemortem / postmortem radiographic matching by dentists and forensic odontologists using a web-based interface as part of a project to assess the reliability of odontology. The study utilised 50 pairs of AM and PM radiographs from real casework, verified by DNA, at varying degrees of difficulty. Participants were shown both radiographs as a pair, and asked to decide if they represented the same individual. Participants were asked to assess their level of confidence in their decision, and to assign one of the ABFO, INTERPOL or DVISYS identification scale points. The mean false-positive rate using the yes/no scale was 12%. Overall accuracy was 89% using this model, However, 13% of participants scored below 80%. Only 25% of participants accurately answered yes or no more than 90% of the time. No individual made the correct yes/no decision for all 50 pairs of radiographs. Use of the graded ABFO, DVISYS and INTERPOL scales resulted in general improvements in performance, with the false-positive and false-negative rates falling to around 2% overall. Yet inter-examiner agreement in assigning scale degrees was moderate, and varied with the apparent difficulty of the match task. There was little correlation between confidence and both accuracy or agreement among practitioners. These results suggest that use of a non-binary scale is supported over a match / non-match call as it reduces the frequency of false positives and negatives. Use of the term "possible" and "insufficient information" in the same scale is proven redundant in this study, and appears to create confusion, reducing inter-examiner agreement. This study represents an important step in validating odontology opinions for identification, yet confidence does not correlate well with accuracy and should not be a factor considered by the reconciliation board when attempting to establish identification.

Extra-oral dental radiography for disaster victims using a flat panel X-ray detector and a hand-held X-ray generator

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ORAL PRESENTATION

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ABSTRACT

Forensic odontologists outside Japan incise the skin for post mortem dental examinations when it is difficult to open the victim's mouth. However, it is prohibited by law to damage dead bodies without a permit in Japan. Therefore, we developed extra-oral dental radiography using digital X-ray equipment with rechargeable batteries to overcome this restriction.

Materials & Methods A phantom was placed in the prone position on a table, and 'lateral oblique radiograph' for posterior teeth and 'contact radiograph' for anterior teeth, a total of three images per case, were taken using a flat panel X-ray detector (FPD) and a hand-held X-ray generator. The resolving power of the images was measured by a resolution test chart, and the dose of scattered X-rays was measured by an ionization chamber type survey meter.

Results and Discussion The resolving power of the FPD was 3.0 lp/mm, which was less than that of intra-oral dental methods, but the image quality of these extra-oral radiographs was adequate enough to compare them with the ante-mortem radiographs. The higher dose of scattered X-rays was laterally distributed, but the dose per case was much less than that of intra-oral dental radiographs. In conclusion, extra-oral radiography is available for disaster victim identification by dental methods even if performed at a disaster scene without electricity and water.

Semi-automatic forensic approach using mandibular lingual canals as fingerprint

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ORAL PRESENTATION

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ABSTRACT

Teeth have been widely used for forensic victim identification. Since the mandible is the strongest bone of the skeleton of the face, it is often preserved after death. Therefore, previous research investigated the mandibular midline neurovascular canal structures as a forensic fingerprint. In their research, observers evaluated cone beam computer tomography (CBCT) data of ante-mortem (AM) and post-mortem (PM) showing an average score of 95% correct identification. In this work, we present a semi-automatic approach to replace the observers with a computer recognition protocol and validate the accuracy of this newly proposed method.

CBCT of mandibles scanned at 2 different moments were collected to simulate an AM and PM situation where the first scan presented AM and the second scan was used to simulate PM. For every scan, the region of interest (ROI) around the mandibular midline was segmented and labelled. Every PM case was compared to all AM and other PM cases via image voxel based registration with mutual information giving a score value between 0 and 1. The case with the highest score was then considered the matched AM of the corresponding PM. This procedure was then repeated one week later to assess the reproducibility of the method via intra class correlation test (ICC).

We hypothesize that this method once validated would be one step closer to a fully automatic identification procedure for victim identification based on the mandibular midline canals only in cases when CBCT is available AM and PM.

Accuracy of dental identification of adults with unrestored teeth comparing previous radiographs of mixed dentition

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ORAL PRESENTATION

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ABSTRACT

Comparative dental identification is a primary method for the identification of human remains: post-mortem (PM) findings are compared with ante-mortem (AM) dental records of supposed matches. A minimum number of concordant points is not necessary, as the accuracy depends on the examiner's expertise and quality of information. Dental comparison requires the availability of AM dental records and relies on the diverse dental pattern and dental treatments among different people. However, in the recent decades, dental interventions have become less necessary and invasive; additionally, the time-lapse between dental records has increased significantly, so the latest radiographs may be dated back to childhood. Consequently, when dental identification is required, the most updated AM data may lack in distinctive or comparable features. Only a few studies evaluated the reliability of comparing dental records with mixed dentition to unrestored permanent dentition.

The primary aim of this study is to evaluate the specificity, sensitivity and overall accuracy of dental identification of adults with unrestored teeth when the most recent AM radiograph was taken during mixed dentition; the secondary aim is to investigate which anatomic features were chosen by the experts in order to reach a conclusion for identification.

The radiographic collection of private dental clinics in Italy and the Dental School of Dundee University were scrutinized to select 15 orthopantomogram (OPG) from male and female adults with healthy permanent dentition; if the patients had completed an orthodontic treatment, they were included in the selection. Radiographs with the presence of any retained deciduous tooth, restorations, root canal treatments and untreated cavities were excluded. Those selected radiographs were considered as post-mortem OPG. From each patient, a previous OPG taken during their childhood or adolescence were selected for comparison; the inclusion criteria were: presence of restored or unrestored deciduous teeth, permanent central incisors or first molars at least partially erupted. Another 30 OPG from other children and adolescents were added to the comparison and also worked as ante-mortem OPG.

A number of 10 forensic dentists received a private invitation to an online survey, which included 15 sections. Each session contained: one PM OPG of one adult and three different AM OPG and two sets of questions. The first question asked to identify the correct match by visual comparison according to

the following options: positive, possible, impossible because of insufficient data and excluded; within the same section, the experts could provide two possible matches, specifying which one was the most suitable. The second question asked to write which features were taken into consideration, in order of importance; no suggestions were provided. There was no time limit for the completion of the survey but the experts could declare the time spent.
Generally, trabeculae patterns and bone marrow cavities are expected to be the most stable and reliable features in time. By contrast, with a long time-lapse between AM and PM radiographs, teeth, inter-radicular, inter-dental and crestal alveolar bone undergo severe changes due to tooth eruption and root formation.

Burnt beyond recognition: the retrieval of post mortem information for victim identification

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ORAL PRESENTATION

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ABSTRACT

Background: Following crash events, victims could become severely incinerated to such an extent that scientific verification of their identity becomes extremely difficult. Loss of all visual clues, the degrading of DNA and the fragility of dental information may limit the comparative information available.

Aims: The aims of this presentation is to update methods of; stabilization of dental information at the scene before retrieval, securing and stabilization of the head for transportation.

Content: Testing and the utilization of a non-volatile spray on dental remains has led to successful retention of dental information for identification in South Australia. Data, cases, problems encountered and solutions will be presented

Prevalence of the agenesis of frontal sinuses in dry human skulls with Metopism

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ORAL PRESENTATION

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ABSTRACT

The frontal bone is an anatomical structure of the skull separated by the metopic suture (MS) in the childhood. The scientific literature indicates that MS consolidates nearly the second year of life. However, this information varies considerably, ranging from 1 to 10 years after birth. Metopism is the term used to describe a MS that persists up to the adulthood. Persistent MS are associated potentially with the agenesis of the frontal sinus. The aim of this study was to investigate the prevalence of absent frontal sinuses in dry skulls with Metopism. The present study was performed after the approval of the local Committee of Ethics in Research. The sample consisted of dry skulls (n=245), aging between 17 and 50 years old, of the Forensic Medical Institute of Goiânia, Brazil. The skulls underwent anthropological exam in the search for Metopism. Radiographic exam was performed in the skulls with Metopism to verify the presence or absence of the frontal sinus. From the 245 dry skulls, 17 presented Metopism. The length of the metopic suture in the skulls, considering the distances between nasio and bregma craniometric landmarks, ranged between 114mm and 137 mm. Radiographic exams were performed on 16 skulls (one skull was not analyzed radiographically because of extensive destruction). Only 1 skull (6.25%) had the frontal sinus absent. Besides the agenesis, the present study also found 4 (12.5%) skull with aplasia and 8 (25.0%) hyperplasia of the frontal sinus in dry skulls with Metopism. The present study found a low prevalence rate of the agenesis of frontal sinuses in dry skulls with Metopism.

Tongue positionand its correlation with the method of death and sequential stages of body decomposition

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ORAL PRESENTATION

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ABSTRACT

Tongue protrusion is a common but non-specific finding in the forensic examination of bodies. Previously protrusion of the tongue in the forensic examination of bodies had only been documented in cases of hanging and advanced putrefaction. No baseline data exists for the prevalence of tongue position in the general practice of forensic medicine and dentistry. This research project was carried out to document the tongue position and condition of the bodies at the time of the forensic examination. This was an observational and analytical study of tongue position and method of death in bodies determined during routine forensic examinations and was carried out by the two authors at the medico-legal mortuary in Pretoria. Tongue position was recorded in all cases where position of the tongue could be visually determined. A protruded tongue was defined as one which extends beyond the dental arches with the teeth separated and a non-protruded tongue was defined as one positioned within the occluded dental arches. The condition of the body was recorded as: fresh, fresh with rigor mortis, bloat, active decomposition, advanced decomposition and dry remains. The results of this research have shown that the majority of bodies presented with their tongues not protruded. It also showed that certain methods of death showed a strong correlation with protruded tongues. This research project has for the first time recorded tongue position in dead bodies and has establish base line data on several aspects on tongue position and method of death while considering the influences of the sequential stages of body decomposition. The results of this research will impact heavily on the day to day practice of forensic medicine and dentistry and highlight the importance of documenting tongue position in all forensic reports

The inheritance of lip prints patterns in the family as a tool of personal identification (study in Javanese population)

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ORAL PRESENTATION

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ABSTRACT

Background : Personal identification is an effort made by Interpol with the help of a doctor or dentist in order to assist investigators in determining a person's identity. Lips are one part of the body that can be used a tool of personal identification. Characteristic patterns are typical of wrinkles and groove (sulci labiorum) on the labial mucosa is lip prints. Previous research has shown that the pattern of lip prints inherited from parents to children. Heredity plays an important role in the development of lip prints as a similarity between parents and children. Based on background it is to do an observation to observe whether there is similarity in the pattern of lip print in the family (Javanese Population) for purposes of personal identification .

Purpose: The aim of the study was to know the inheritance of lip prints in the family as a tool of personal identification.

Method: This study was conducted on a one hundred and fourteen lip prints sample from thirty three family. The lip print were recorded by applying lipstick on the lips, than cellophane tape was applied on the lips and the prints were taken.

Results: This study is proving that percentage of lip print patterns inherited from father to child(85.1%) and from mother to child (78.4%). The pattern of lip prints predominant inherited from father to daughter (89.5%) and predominant inherited from mother to son (82.5%). Type III was to be predominant lip print pattern inherited from parents to child (99%) and type VI is the least lip prints pattern inherited from parents to child (3.1%). Lip prints pattern type IV did not inherited from parents to child.

Conclusion: This study shown that there is inherited lip prints pattern from parents to child. Father's lips print more dominant inherited to daughter than son, otherwise mother's lip print more dominant inherited to son than daughter.

Analysis and comparison of human DNA in dental calculus with Barr bodies for gender determination: a comparative blind study

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ORAL PRESENTATION

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ABSTRACT

Title: Analysis and comparison of human DNA in dental calculus with Barr bodies for gender determination: a comparative blind study.

Context of the problem: In majority of identification cases, investigators rely on either bone or teeth as the source of DNA. But there are instances in which the remains are either not well preserved or not permitted by the law or family members to be disintegrated for the sole purpose of identifying the dead. Due to environmental insult of the post-mortem data, the samples may not yield DNA sufficient enough for analysis. Thus the scope of the present study lies in identifying the unknown without scarifying the structural integrity of the dead remains.

Aim: To analyze and compare human DNA in dental calculus with Barr bodies for gender determination.

Materials and methods: In this study fifty subjects who fulfilled the inclusion criteria were selected from the dental outpatient department. Patient's demographic data was recorded and the most pronounced portion of dental calculus was collected. These samples were subjected to gel electrophoresis for DNA estimation and quantification. For gender determination DNA samples were subjected to Short Tandom Repeat (STR) profiling for identification of sex specific chromosomes/genes. For Barr body analysis, buccal smear was made by gently scrapping the buccal mucosa uni-directionally and analyzed histologically for the presence/absence of Barr bodies. Finally the results of both the procedures were tabulated and subjected to descriptive statistical analysis.

Results: Human DNA (genomic) was found in 80% cases ranging from 21.5µg/ml to 34µg/ml. The average amount of DNA was 18.8µg/ml ± 13.06 µg/ml .Accurate gender determination from DNA samples was possible in all the cases.

Conclusion: Dental calculus is an excellent reservoir of human DNA and can serve as a tool for personal identification and gender determination.

A systematic review of dental sex estimation methods

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ORAL PRESENTATION

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ABSTRACT

Background*:* In forensic odontology, dental sex estimation plays an important role for positive identification of unidentified human remains.

Aim*:* To describe all the utilized methods of dental sex estimation presented in the literature to date. The set research question was: What dental sex estimation method is the most accurate?

Materials and methods*:* An electronic search until November 29th 2016 was performed in 5 databases: MEDLINE/PubMed, Cochrane, SciELO, LILACS and Grey literature. The PRISMA guidelines were used. Studies were assessed and included based on the considered population and sample size, the age range, the sex estimation method, the type of statistical analysis and the study outcome. The extracted data enabled to classify the different studies. Meta analysis was used to compare the extracted study outcomes per obtained study group.

Results*:* The established search string detected 4721 studies. 142 were considered eligible after review of title, abstract and full-text, according to the set exclusion criteria. Sex determination methods were classified based on dental metric and non-metric measurements (n=90), cephalometric analysis (n=16), frontal and maxillary sinuses (n=8), cheiloscopy (n=6), palatal features (n=5) and DNA analysis of teeth (n=17). Teeth measurements for sex estimation were mainly performed on casts (n=52), followed by skeletal remains (n=17), radiologic imaging (n=7), intraoral measurements/photography (n=6), and combinations of the above (n=9).

Discussions and Conclusions*:* The variety of published dental sex estimation methods highlights the importance of sex estimation in human identification. In forensic practice, according to the available evidence, a need to be able to select the most appropriate evidence based dental sex estimation method exists

Sex determination and age estimation by mandibular measurements in Brazilian sample

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ORAL PRESENTATION

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ABSTRACT

For human identification purposes, the most important steps in the anthropological profile are the sex determination and age estimation. Mandible has proved to be efficient for these determinations. The aim of this study was to determine sex and estimate age in Brazilian sample using mandibular measurements: ramus height (Co-Go), coronoid height (Cr-Go), gonial angle (Go), bigonial distance (Go-Go) and maximum mandible length (Co-Pg). It was used 53 female mandibles and 50 male mandibles with mean age of 59.96 and 52.92 respectively, from the Bones Museum (Department of Social Dentistry and Forensic Dentistry, Piracicaba Dental School). All values were higher in men than in women except for Go. All measurements were statistically significant for sex determination. Even using measures that have points considered subjective, the intraclass correlation was 0.89 to 0.93, being considered excellent. When the measurements were remade were found excellent intraobserver index. For age estimation, the mandible sample were grouped per age, G1: 0-20 years; G2: 21-40 years; G3: 41-60 years; G4: 61-80 years; G5: 81-100 years, regardless of sex. It was observed a gradual increase in all measures between G1 and G2, but the other groups were not uniform. It was verified that in group G1 the smallest measures were found: Go 118; Go-Go 83.7; Co-Pg 109.6; except for Cr-Go 55.8 and Co-Go 53.15 values that were lower in G5. The measurements that were statistically significant for age estimation were Go and Co-Go. It was concluded that it is possible to perform the sex determination by mandibular measurements, but the age estimation suffered large variations, not having a pattern between the groups and measures, so it is not recommended to use only these measurements for this purpose.

Reliability and analysis of changes in bite marks at 0 and 24 hours

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ABSTRACT

Based on the concept of dental uniqness[1] if at the crime scene, bite marks are found on foodstuff like cheese, chocolate, candy, apple, preserved meats, they can be recorded[2,3,4] as they provide three-dimensional impression of the suspect's dentition.[5] The purpose of this study was to assess changes in bite marks with a passage of time and to see the utility of matching bite marks in both perishable and non-perishable objects with a passage of time at different temperature ranges.

The study was conducted at MPCD & RC, Gwalior, India. 20 volunteers were asked to bite 6 items each. Perishable items (apple, banana and burfi) and non-perishable items (wax, clay, and rubber). Photographs were taken with digital camera just after biting these items and after 24 hours of biting; both at temperature ranges of 24°C to 28°C and 36°C to 40°C respectively. Life size photograph of this bitten object was printed on transparent overlays and compared to hand drawn transparency prepared from suspect dentition using X-ray viewer. The comparison was done by two researchers of all the 960 transparencies.

The results were tabulated and the accuracy of bite mark analysis on all 6 items were analyzed by Kuskall-wallis ANOVA test. Our result showed that all objects gave a positive result on matching just after biting. After 24 hours, all items showed positive matching except banana and apples. Fisher exact test was done for in between group comparisons at 24°C to 28°C and it was found that bite marks on apple and banana matched significantly lower as compared to other perishable (burfi) and non-perishable (wax, clay, rubber) items ($p<0.001$). Although positive matching of bite marks present in burfi were comparatively less than non-perishable items yet the difference was not significant statistically ($p=0.231$). Further in between group comparisons at 36°C to 40°C showed that bite marks present in apple and banana matched significantly lower as compared to other perishable (burfi) and non-perishable (wax, clay, rubber) items ($p<0.001$). Burfi showed same number of matched bite marks as compared to non-perishable items thus showing no difference from non-perishable items ($p=1$).

This study helped in evaluating the fact that time lapse and temperature variations can affect the evidence present at the crime scene. The influence of the time lapse on the food depends on the kind of food examined.[6] Foodstuffs are subjected to considerable shrinkage and distortion that in turn distorts the marks in test media. Apples and banana loses a great deal of water content and become rusted so photography

should be done within a short time.[6]
Researchers have analyzed and interpreted effect of time and temperature on bite marks and have proposed a new simple, reliable and less technique sensitive procedure. Also highlighted the fact of decomposition, there occurs changes in perishable food items and more so in apples and bananas that make bite marks less reliable evidence.

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Focus on the expertise of bitemarks : from experimentation to scientific standards

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ABSTRACT

Among the numerous missions realized by the Forensic odontologist, the morpho-analysis of human bitemark, both on an alive or dead victim, plays a relevant role since the identification not only affect the victim herself but concerns someone else: the perpetrator

This analysis requires to compare the bitemark left on the victim's skin by teeth having the dental impression of the assumed perpetrator of the crime.

For over a century, many experts have been working to make bitemark analysis more reliable and improve dental impression recording but it is not until the 90s that different teams will take advantage of the development and the diffusion of computing to eliminate errors deriving from the manual reproduction of drawing.In this context of changes, Georget and Duret share the opinion that the use of an optical camera to perform 3D scans could be quite interesting and useful to analyze bitemarks in the forensic odontology. Finally, in 2013, this project came to life thanks to a moral partnership between the odontology team of the Institut de Recherche Criminelle de la Gendarmerie Nationale Française (IRCGN) and AABAM company, the manufacturer that designed and produces the optical camera Condor®. The research undertaken consists in verifying that the reproduction and accurate measurement of the shape of the modeled object, the exact reproduction of the colour of the real object by the virtual object, the scale preservation are respected and meet forensic requirements.Today, adaptation and use of optical dental prints as an acquisition tool of 3D set of images of bitemarks and suspected offender dental arches modelling are an advanced technological asset.Our odontology team uses the Cloud Compare® software to automatically generate overlays that represent close cuts from 3D images produced by the reconstruction and storage software associated with the optical camera. The automated tracing makes the obtained teeth contour quite reliable, since it prevents the possibility for an expert to interfere by retouching images. It eliminates also some claims, coming from lawyers or trier of facts, doubting the accuracy of the images submitted by the examiners.The present most used methods of bitemark analysis are not effectively compliant with any scientific rule. It is hence necessary to use new tools offered by this technology. Nowadays proofs obtained by bitemark analysis are originated by experimental activity but it is fundamental and necessary for this kind of methods that such evidence finds its roots in scientific data and sufficient technical knowledge to be validated by Courts.

This first work could provide an answer to the panel of American experts of the White House which has reported an inventory of forensic sciences whose the conclusions are approved by the Presidency of the Council of Science and

Technology on September 1st, 2016.
Among the recommendations related to our field, the bitemark analysis, which was strongly criticized in 2015, is still considered not satisfactory with respect to the required scientific standards.

A scientific evaluation of five selected dental features for use in court cases involving bite marks

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ABSTRACT

The presence of recognisable dental features, together with an understanding of their discriminatory potential, constitutes the foundation of bite mark analysis. The prevalence of dental features within most populations is unknown and therefore cannot be used with any degree of scientific certainty while giving evidence in court cases involving bite marks. This study represents the largest data set of descriptive statistics in five selected dental features commonly observed in bite mark cases. The features studied included intercanine distances, arch shapes, diastemas, missing teeth and the difference in height between the central incisors in both mandibular and maxillary arches.

The bite mark research was conducted on 4286 self –classified volunteers from four racial groupings. The bite registrations were taken on a double layer of pink wax folded around a cardboard strip which gave a good representation of the features present in the anterior dentition. Plaster casts were made from the wax bites and each of the features analysed. The frequencies, means, Standard Deviation, median and Interquartile ranges for all of the features were analysed. The interrelationship of the features was also analysed. To test whether interrelationship existed between the intercanine distance and other dental features, an ANOVA analyses were carried out. The results showed statistically significant correlation between intercanine distance and arch shape, intercanine distance and midline diastemas, intercanine distance and missing teeth and intercanine distance and differences in central incisor height. This study makes weighty impact to the analysis of features present in bite mark cases at the time when subjective opinions need to be replaced with sound scientific data.

Digital 3D analysis – bitemark and database

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ORAL PRESENTATION

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ABSTRACT

The analysis of bitemarks has been done through analogical methods. Bitemarks can now be turned into more consistent evidence by using a digital tridimensional (3D) analysis.

This study intended to present a pattern of comparison between a foodstuff bitemarks (apple) and suspects' individual dental arches, by the analysis of tomographic images.

For this purpose, the researchers studied the match process of three-dimensional reconstruction monitoring by slice morphological analysis (sagittal, axial and horizontal).The matching process was made by bitemark and dental arches reference points. Those interdental contact points were: central incisor/central incisor, central incisor/lateral incisor and lateral incisor/canine. In the matching process we also took into account the shape of the arch, absences or malposition of teeth in the anterior sector that could help in concluding if the bitemark belonged or not to the suspect analysis.

The results were classified in: presumable or not presumable author of the bitemark. With this methodological pattern, the bitemark analysis was quick, easy and precise comparing with conventional analogic methods.

This study will allow to accurately match the foodstuff bitemark evidence and suspects' individual dental arches by tomographic images. In the future this analysis will be done by database software.

Bite-mark analysis: statistics as a tool in assessing validity and reliability of bite-mark evidence

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ABSTRACT

Background: In 2009, the National Academy of Science conducted a review of forensic disciplines and their role as expert evidence in the US. The review took into consideration cases in which the convicted individual was subsequently exonerated due to DNA testing following judicial reassessment. Together with other latent print identification techniques, the report was critical of forensic odontology, and in particular of bite mark analysis and comparison. The NAS reported that the limitations of forensic techniques included inadequate scientific underpinnings, a paucity of research on human observer bias, and lack of technological innovation. It indicated that both scientific and systemic changes need to be made to bite-mark analysis, to ensure their reliability, establish standards and to promote practices that are consistent. Instead of dismissing bite-mark analysis as just another poor forensic science, the path forward should be to understand the drawbacks of the technique and follow a rigorous and comprehensive research program to address issues that are relevant to the improvement of bite-mark analysis.

Materials currently used in making dental casts for forensic investigations of bite-marks undergo structural and chemical changes during setting, and the casts may not be completely accurate as a consequence. Intraoral 3D scanning of dentitions has the potential to provide a fast, accurate and non-invasive method of recording dental information, however, they are yet to be validated for use in forensic investigations.

Aim: The aim of this study was to assess the reliability and validity of a portable intraoral 3D scanner appropriate for recording suspect dentitions in forensic investigations.

Methods: Reliability of the intraoral 3D scanner was quantified by comparing means of test-retest, rater-rater and method-method differences, calculation of intra-class correlation coefficients (ICC) and standard error of measurements (SEM) of 110 landmark dental features made on 50 sets of human dental casts. To estimate the intra-class correlation coefficients, a novel method of concurrent assessment of inter-and intra-rater reliability in a three-factor (subjects, methods, raters) design with replication was carried out by extending the approach of Eliasziw et al for two factors with replication. The approach by Eliasziw et al allows concurrent assessment of reliability between and within methods and raters and has never been used in bite-mark analysis.

Conclusions: This study addresses the paucity of research on using technological advancements to enhance the scientific

underpinnings in bite-mark analysis. The methods used in this study demonstrate that the measurements of landmark features made from the portable intra-oral 3D-scanner are reliable and of comparable reliability to those made by conventional hand-held callipers and can be a used to record and measure dental information during bite-mark analysis.

Significance of this presentation: In this presentation, I will briefly outline my research and compare the estimations of ICCs using a conventional approach (Shrout and Fleiss) and by using the approach by Eliasziw et al and the differences of using the above mentioned methods in a reliability study with repeated measurements.

Immigration issues and age estimation of asylum seekers: the rough pathway between law and ethics

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ABSTRACT

Immigration to, and asylum seeking in an European country has never been such an important phenomenon as it is currently evident from the daily chronicles. In 2015 as many as 1.006.551 asylum seekers arrived at the EU borders, with a sharp drop in 2016 (about 260000 in the first half of 2016). Therefore immigration must be considered as one of the core issues in the European Union (EU) policies and a major concern for the EU as a whole. Age is one of the main parameters to establish a biological profile of an individual. When the asylum seekers' (AS) age is unknown or is questioned by the authorities and considered not valid or unreliable, age estimation procedures are necessary to determine if that individual is accountable for his actions in criminal law, shall undergo specific obligations (educational, for instance) or should receive specific aides or other providences from the state administration. Moreover, important administrative and civil issues rely on an individual's age. Therefore, at the EU borders, the age of the asylum seeker is the first and most important parameter to obtain the permission or the refusal to enter the EU. Moreover, the Schengen Act (2006) enables the free movement of individuals within the Schengen Area countries. As such, once granted the entrance in the EU, the asylum seeker can freely move from country to country within the EU area. Due to the many implications of age estimation, not only for the asylum seeker and his/her future but also for the whole EU community, the age estimation procedures need to be standardized and considered as one of the major issues, forging the future EU immigration policies and regulations. Currently, no common European law exists on immigration requirements and procedures which defines in detail the procedures for age estimation and requirements to be performed, currently mainly governed only by simple technical recommendations issued by national or local scientific institutions. No common ethical code exists so far even if in some countries a debate about the ethical issues on the methods for age estimation already exists and is nowadays rising its voice.

Science, ethics and demagogy: on recent attacks against forensic age estimation in Germany

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ORAL PRESENTATION

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ABSTRACT

Background: Age estimation is a scientific discipline that comes into play in the context of archaeological research, the question of criminal responsibility, the decision whether a person has reached relevant age limits in civil proceedings, the identification of unknown human corpses, and others. Although the matter is unspectacular in general, it is most controversial when young unaccompanied refugees (YUR) have to undergo forensic age diagnostics in order to decide whether they are of minor age and, therefore, deserve for the special protection and care of the state that apply to minors. A most recent statement of the Ethical Committee of the German Federal Medical Association claimed that forensic age estimation in YUR is unethical and should be banned. In our talk, we try to put this discussion on a scientific basis. We shall explain the difference between mathematical models to estimate the age of a person (regardless of any political preference) and applying these models to legal and political decision making. We shall also highlight that science is not unpolitical: the mathematical truth is independent on policy, but it is the responsibility of scientists to explain politicians the probable consequences of their decisions.

Methods: We will explain how the decision about the age of minority is linked to the general diagnostic paradigm. We will point out the risks and consequences of false positives (minors classified as adults who will not receive the care they deserve) and false negatives (adults classified as minors who will unduely use resources that are reserved for children). We shall also critically discuss the methods of the opponents of age estimation in YUR.

Results: Methods of age estimation are the same (and have the same precision) in YUR as well as in other contexts. Age estimation is driven by the examination of the relationship between biological markers of age (skeletal, dental etc.) which is independent of the individuals to whom it is applied (YUR or other). On the other hand, setting the diagnostic threshold (e.g., which minimum age should be estimated to treat an individual as an adult) is a question of political decision making that purposefully weighs false positive and false negative decisions against each other. Furthermore, we note that advocates of "alternative" approaches (e.g., psycho-social clearing) have zero hits in a PubMed search on age estimation.

Conclusion: The current campaign against forensic age estimation is driven by ideology, is lacking scientific methodology, and is based on the inability to discriminate

between objective scientific methods and political responsibility. Everybody needs to face the reality that diagnostics is never free of error (and so is the action following the diagnostics), and this simple fact also applies to the diagnostics of minor age in YUR. It needs to be accepted that age estimation in YUR is not an evil that is responsible for this dilemma; it is a scientific tool to minimize errors in decision making in this field.

Root Canal Width (RCW) patter of permanent molars: a reliable Mandibular Maturity Marker (MMM) to determine a subject's status at the 18-year threshold

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ORAL PRESENTATION

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ABSTRACT

Introduction: The narrowing of the root canals of the permanent molars during normal growth follows an age-related pattern. 2,000 subjects to provided a Reference Data Set for UK Caucasians.[1] There is a gradient with the distal root canal of LL8 being wider than the distal root canal of LL7 which in turn is wider than the distal root canal of LL6 (FDI nomenclature 38, 37, & 36).

Materials and Methods: DAE legal cases from 2005 to 2015 were re-examined. RCW assessment was used to assign subjects above or below the 18-year threshold, as follows:

1. Presence of Demirjian Stage H for LL8 (FDI 38). If the LL8 was absent the LR8 was used as an alternate.
2. Then, RCW was assessed using the specified criteria[1]

Results: From the total of 410 forensic age assessments there were 182 subjects with tooth 38 (or 48), at Stage H. The following probabilities were derived for both genders.

The probabilities of a subject being over 18 years using RCW are shown in the table. For both females and males subjects with RCW-C is 100%. For RCW in males the probability for RCW-B and RCW-C is 100% for the subject being over 18 years.

Discussion: The presence of RCW - C (in females) and RCW - C or D in males is a clear indicator that the subject is over 18 years old. For RCW - A and RCW - B in females and RCW – A in males there is a small chance that the subject is under 18 years old. The MMM are limited to subjects for whom the LL8 (or LR8) in Demirjian Stage H is present on the Dental Panoramic Tomograph.

Conclusion: The presence of RCW – C in females and RCW - C or RCW - D for males indicates a 100% probability that the subjects exhibiting this feature are over 18 years old.

Females	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**%-age < 18 years**	**n - tds for RCW Legal Cases in females**
RCW - Af	21.30	2.09	953	95.3	4.7	8
RCW - Bf	21.93	2.24	980	98.0	2.0	12
RCW - Cf	23.62	1.60	1.000	100.0	0	4
Males	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**%-age < 18 years**	**n - tds for RCW Legal Cases in males**
RCW - Am	20.03	2.07	962	96.2	3.8	42
RCW - Bm	21.82	2.13	1.000	100.0	0	95
RCW - Cm	23.17	1.91	1.000	100.0	0	21

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2. www.dentalage.co.uk see section Reference Data Sets.

Periodontal Ligament Visibility (PLV): a reliable Mandibular Maturity Marker (MMM) to determine a subject's status at the 18-year threshold

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ABSTRACT

Introduction: Gradual obliteration of the radiographic appearance of the periodontal ligament of lower third molars, indicating an age above 18 years was first published in 2010 (Olze et al.) This was tested on 2,000 subjects to provide a Reference Data Set for UK Caucasians.[2] The concordance of the results from these two studies led to introduction of the PLV assessment for forensic age estimation in the UK. It was deemed appropriate to re-assess the Dental Age Estimation (DAE) cases carried out by the DARLInG team in London.

Materials and Methods: DAE legal cases from 2005 to 2015 were re-examined. PLV assessment was used to assign subjects above or below the 18-year threshold. As follows:

1. Presence of Dermirjian Stage H for LL8 (FDI 38). If the LL8 was absent the LR8 was used as an alternate.
2. Then, PLV was assessed using the combined criteria (Lucas et al 2016)

Results: From the total of 410 forensic age assessments there were 191 subjects with tooth 38 (or 48), at Stage H. The following probabilities were derived for both genders.

The probabilities of a subject being over 18 years using PLV are shown in the table. For both female and male subjects with PLV- C and PLV- D the probability of being over 18 years is 1.000 [100%]

Discussion: The presence of PLV- C and PLV- D is a clear indicator that the subject is over 18 years old. For RPV- A, and RPV- B there is a small chance that the subject is under 18 years old. The MMM are limited to subjects for whom the LL8 (or LR8) are present on the Dental Panoramic Tomograph.

Conclusion: The presence of PLV- C and PLV-D for both females and males indicates a 100% probability that the subjects exhibiting this feature are over 18 years old.

Females	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**n - tds for RPV** **Stages in females**
PLV- Af	19.57	1.83	858	85.8	4
PLV- Bf	21.25	2.16	841	84.1	22
PLV- Cf	22.96	1.95	1.000	100.0	9
RLV- Df	23.86	1.79	1.000	100.0	1
Males	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**n - tds for RPV** **Stages in males**
PLV- Am	20.32	1.61	910	91.0	40
PLV- Bm	21.17	2.13	974	97.4	87
PLV- Cm	22.49	2.11	1.000	100.0	26
RLV- Dm	23.37	1.85	1.000	100.0	2

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3. www.dentalage.co.uk see section Reference Data Sets.

A radiographic study estimating age using periodontal ligament visibility of mandibular third molars

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ORAL PRESENTATION

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ABSTRACT

Visibility of the periodontal ligament of mandibular third molars (M3) has been suggested as a method to estimate age. The aim of our study was to compare visibility of the periodontal ligament width in left and right M3 and assess the accuracy of age estimation. The sample was archived panoramic dental radiographs of 163 individuals (75 males, 88 females, age 16-53 years) with mature M3's.

Method. Reliability was assessed using Kappa. Stages were compared between left and right M3. Minimum age of stages was described. Accuracy was assessed by comparing estimated and chronological ages for males and females. Stages were cross-tabulated against age categories younger than and at least 18 years of age.

Results showed excellent reliability. The left and right M3 stage differed in 46% of the 85 individuals with readings from both side. Minimum ages of stages 0 to 2 were younger than previously reported. Mean difference between estimated and chronological ages was 7.21 years (SD 5.16) for left M3 and 7.69 (SD 6.08) for right M3 in males and 6.87 (SD 5.83) for left M3 and 8.61 (SD 6.58) for right M3 in females. Only stage 3 in left M3 could discriminate between males and females younger and at least 18 years of age.

Conclusion. These findings show that visibility of the periodontal ligament differed between left and right in almost half our sample. Ages of the four stages overlapped. Our findings question the use of this method to estimate age or to discriminate between age younger and at least 18 years.

Forensic age estimation based on development of third molars: a staging technique for magnetic resonance imaging

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ABSTRACT

Background: The development of third molars can be evaluated with medical imaging to estimate age in subadults. The appearance of third molars on magnetic resonance imaging (MRI) differs greatly from that on radiographs. Therefore a specific staging technique is necessary to classify third molar development on MRI and to apply it for age estimation.

Aim: To develop a specific staging technique to register third molar development on MRI and to evaluate its performance for age estimation in subadults.

Materials and methods: Using 3T MRI in three planes, all third molars were evaluated in 309 healthy Caucasian participants from 14 to 26 years old. According to the appearance of the developing third molars on MRI, descriptive criteria and schematic representations were established to define a specific staging technique. Two observers, with different levels of experience, staged all third molars independently with the developed technique. Intra- and inter-observer agreement were calculated. The data were imported in a Bayesian model for age estimation as described by Fieuws et al. (2015). This approach adequately handles correlation between age indicators and missing age indicators. It was used to calculate a point estimate and a prediction interval of the estimated age. Observed age minus predicted age was calculated, reflecting the error of the estimate.

Results: One-hundred and sixty-six third molars were agenetic. Five percent (51/1096) of upper third molars and 7% (70/1044) of lower third molars were not assessable. Kappa for inter-observer agreement ranged from 0.76 to 0.80. For intra-observer agreement kappa ranged from 0.80 to 0.89. However, two stage differences between observers or between staging sessions occurred in up to 2.2% (20/899) of assessments, probably due to a learning effect. Using the Bayesian model for age estimation, a mean absolute error of 2.0 years in females and 1.7 years in males was obtained. Root mean squared error equalled 2.38 years and 2.06 years respectively. The performance to discern minors from adults was better for males than for females, with specificities of 96% and 73% respectively.

Conclusion: Age estimations based on the proposed staging method for third molars on MRI showed comparable reproducibility and performance as the established methods based on radiographs.

Comparison between estimated age from teeth and bone development

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ABSTRACT

Background: In age assessment of children the recommendations are that they are based on development of both teeth and bone, but there is no recommended procedure to collate these results. It has been shown that there are different genetic mechanisms controlling dental and skeletal development. It is therefore of interest to look at the relationship between age assessments performed by these two independent methods. The purpose was to check for real differences and reveal systematic differences between the two methods.

Material and methods: This was a retrospective study where examination had been performed on 3333 asylum seeking boys and 486 asylum seeking girls who attended for age assessments from January 2010 to December 2014. Their chronological age was unknown. The skeletal age estimation was performed on radiographs of the developing bones in the hand and wrist using the atlas of Geulich and Pyle (1959). The dental age assessment was made based on clinical assessment and using tables from Haavikko (1979) and Liversidge (2008) on developing teeth on OPG radiographs. The agreement between the two age assessments was classified into four groups: Agreement 1: Individual is 18 years or older from both age assessments. Agreement 2: Individual is younger than 18 years from both age assessments. Mismatch 1: Individual is 18 years or older from skeletal age assessments and younger than 18 years from dental assessment. Mismatch 2: The individual is younger than 18 year from skeletal age assessment and 18 years or older from dental age assessment. Man-Whitney test was used to compare the mean of the two independent groups.

Results: The agreement was 79.5% for girls and 83.2% for boys. Over the 5year period there was a shift towards young applicants which resulted in a higher percentage of boys being estimated older from dental development than from skeletal development.

Discussion: The good agreement is encouraging and strengthens the final age assessment. The mismatch may in part be due to the grading system used to assess age from dental radiographs which is a different procedure than assessing age from hand/wrist radiographs. It is known that dental development shows greater biological variation, but this study indicate that this variation does not deviate much from skeletal development.

Conclusion: The results show that there is good agreement between age assessments based on dental and skeletal developments.

Estimating age in young adults using shape changes in the third cervical vertebra

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ABSTRACT

Estimating chronological age in young adults is difficult and additional methods are required. This study explored a new method to assess the third cervical vertebra maturation and compared the results with the maturation of the second and third mandibular molars (M2 and M3) in order to assess the chronological age of 18. The sample was radiographs of 174 dental patients (78 males, 96 females aged 15-22 years). A semi-automated method was developed to analyse shape changes of the third cervical vertebra (C3). Eight variables were compared in two age categories: younger than 18 and at least 18 years of age in males and females separately using a t-test. Tooth formation of M2 and M3 was assessed. Mean values of eight variables in boys and one variable in girls were significantly different between the two age categories ($p<0.05$). Results for boys showed that the best age indicator for age ≥18 is the ratio between height and width of C3 and the ratio between diagonals. Results for molars showed that M2 was mature in many cases and M3 was highly variable or missing. We conclude that shape change of C3 has potential as an additional method to estimate age in young adults.

Age estimation using cervical vertebral maturation

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ORAL PRESENTATION

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ABSTRACT

Aim: the aims of this study were to 1) assess the reproducibility of Cervical Vertebral Maturation (CVM) method as described by Baccetti et al., 2) evaluate the relationship between chronological age and CVM stages 3) investigate the potential for age estimation of this method.

Materials and Method: the sample consisted of 474 lateral cephalometric radiographs, from patients aged 6.4-22.4 years (217 males and 257 females), following specific inclusion criteria. Six raters of various educational backgrounds were trained to CVM method. All images were assessed twice under the same conditions. Intra- and inter-rater agreement was assessed by Cohen's weighted kappa and intraclass correlation coefficient, respectively. Analysis of variance was fitted to investigate the correlation between chronological age and cervical maturation stages. The potential for age prediction was tested by general linear model regression analysis.

Results: intra-rater reliability ranged from 0.857 to 0.931. Intra-rater absolute agreement ranged from 77% to 87.3%. Inter-rater reliability was >0.9, whereas inter-rater absolute agreement was <50%.The lowest reproducibility was found for the 3rd Cervical Maturation Stage (CS3). Mean age differences among the 6 CS stages were statistically significant and increased as the CS increased. Linear model regression analysis showed that although gender and CS could explain roughly 60% (adjusted R^2=0.61) of the age variance of the sample.

Conclusions: CVM method presented high intra- and inter-rater agreement. However, CVM cannot predict accurately the pubertal growth spurt. A direct and expected correlation was found between chronological age and cervical stages. CVM method provides a broad estimation about chronological

Why are cervical vertebrae not suitable for age estimation?

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ABSTRACT

Background: The ability of cervical vertebrae (CV) staging to contribute in forensic age estimation is being discussed as a controversial issue. In head-to-head comparisons, CV methods have repeatedly been shown to be inferior to methods using hand bones or teeth. A reason might be the large variability of CV geometries in the end stage of development. Here we study measures of the geometry of adult CV and demonstrate that the description of the "typical" appearance of adult CV is often not met.

Methods: Lateral cephalograms from clinical routine of 309 subjects aged 20 years or above (median 24 years, 51% female) were evaluated. The criteria for the end stage of CV development (e.g., Hassel-Farman stages V/VI or Baccetti stage V) were examined using quite liberal thresholds of metric quantities for definition: 1. rectangular shape of C3 and C4 – considered fulfilled if anterior:posterior height ratio was ≥0.9 and the angles between the anterior/posterior and the superior side were ≥70° and ≤110°; 2. at least one of C3/C4 rectangular in vertical shape (if not both, the second is squared) – considered fulfilled of height:width ratio was ≥0.9; 3. Significant concavities at the inferior margin of C2, C3 and C4 - considered fulfilled if the angles of the concavities were ≤160° (reference images for established staging schemes suggest <150°). Metric data of the adults were also compared to those of 102 children aged 8-10 years (49% female).

Results: Adult CV often violated the criteria of rectangular shape (45% C3, 34% C4), of height:width ratio (17% C3, 36% C4) and inferior concavity (10% C2, 10% C3, 18% C4). All of the criteria for an adult CV shape were fulfilled in only 24% of the subjects (95% confidence interval 19-29%). The variability of measures of the CV shapes was large; for example, the 95% reference ranges (2.5th-97.5th percentile) for the height:width ratios were 0.81-1.20 (C3) and 0.78-1.14 (C4). Moreover, overlap with the data of the children was considerable: 6% and 10% of C3/C4 height:width ratios of children were in the adult reference ranges.

Conclusions: While hand bones and teeth have well-defined appearances in the end stage of development (closed epiphyseal lines and closed root apices, respectively), adult cervical vertebrae have largely varying shapes with a material overlap even with young children. This makes it difficult or even impossible to define the "typical" end stage appearance of CV that would capture all adult cases and, at the same time,

reliably separate younger from older subjects. We conclude that CV are of limited value for age estimation. As this limitation arises from biological variability of adult CV geometry, it cannot be overcome by using innovative imaging techniques like cone beam CT.

A radiographic study of mandibular third molar timing in different ethnic groups.

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ABSTRACT

The nature of differences in the timing of tooth formation between ethnic groups is important when estimating age. The aim of our study was to calculate age of transition of mandibular third (M3) molar tooth stages from archived dental radiographs from sub-Saharan Africa, Malaysia, Japan and two groups from London UK (Whites and Bangladeshi). The number of radiographs was 4430 (1974 males, 2456 females) with an age range 10-23 years.

Method: The third molar was staged into Moorrees stages. A probit model was fitted to calculate mean ages for transitions between stages for males and females and each ethnic group separately. The estimated age distributions given each molar stage was calculated. To assess differences between ethnic groups, three model were proposed: a separate model for each ethnic group, a joint model and a third model combining some aspects across groups. The best model fit was tested using Bayesian and Akaikes information criteria (BIC and AIC) and log likelihood ratio test.

Results: Differences in mean ages of transition of M3 stages were noted across ethnic groups. Mean ages between male groups were less variable than between female groups. Small differences were also noted between timing of M3 between males and females. BIC suggested that a joint model was best with some common features between ethnic groups, however AIC and log likelihood ratio test showed that a separate model for each ethnic group was best.

Conclusion: Some group differences were evident in M3 timing, however, every group showed a large standard deviation in age for each M3 stage. This suggests that a reference data set (with a wide age range and uniform distribution) is probably more important than a population specific convenience sample to estimate age of an individual using M3.

A system of dental age estimation for children and young adults.

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ABSTRACT

Introduction

The need for Age Estimation in the Living continues with the arrival of many children in the UK from countries outside Europe. There are a number of methods of estimating age in such children but until recently these were not acceptable to the Immigration Court in England. Entangled with this issue is the perception that many of the subjects applying for status as Unaccompanied Asylum Seeking Children (UASC) have an adult appearance. The reason for this is Child Status carries the right to remain in the UK and to receive family support, education, and medical care.

Background to the Legal Process

Over the last 15 years the main agency for estimating the age of UASC, and by extension adult looking individuals claiming to be children are staff of the Social Service Departments of Local Government.

This followed a Judicial Review, generally known as *A v Croydon* 2009. This led to the adoption of a specific method of age assessment based on a Holistic Approach. Dental Age Estimation (DAE) whilst not completely excluded was considered 'too draconian' to require a UASC to submit to this process. In addition the Social Workers Age Assessment was considered to be more accurate than DAE

Procedures Used for Dental Age Estimation in the Living

The basis for DAE is

1. A Clinical History and Oro-Dental Examination
2. A Dental Panoramic Tomograph (DPT)

Once the radiographic image is available, a preliminary determination of the subsequent course of investigation is made. If the 3rd molars have not completed growth (ie Demirjian stage G or less) then the Simple Average Method (SAM) is used.

If the 3rd molar has completed growth (Demirjian Stage H) then the Threshold Assignment Method (TAM) is used.

The recent Judicial Review in the Asylum Court (October 2016 JR/3413/2016\UTIAC) led to a number of important decisions.

Legally Acceptable Procedures for Dental Age Estimation are

1. The Simple Average Method using Percentile Data resulting in an average age define by the Median (50th %ile) and the Interquartile Range (IQR). This can be derived by looking up the data in www.dentalage.co.uk/+R/RDS

2. The presence of stage H alone is not sufficient evidence to determine whether or not a subject is over 18 years of age. The court regarded this as a meaningless assessment.

3. The use of Mandibular Maturity Markers (MMM) comprising Root Canal Width (RCW). Root Pulp Visibility(RPV) and Periodontal Ligament Visibility whilst clearly alluded to suffered because 'None of the Mandibular Maturity Markers described in this judgement has yet been sufficiently examined to enable it safely to be said that it is diagnostic of age.'

Conclusions

The use of The Simple Average Method (SAM) for children, and the Threshold Assignment Method (TAM) for young adults provides Age Estimates that are potentially acceptable to The Immigration Courts in the UK.

Performance of an automated lower third molar staging technique on panoramic radiographs

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ORAL PRESENTATION

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ABSTRACT

Background: Automated methods to evaluate growth of hand and wrist bones on radiographs and magnetic resonance imaging have been developed. They can be applied to estimate age in children and subadults. Automated methods require the software to (1) recognise the region of interest in the image(s), (2) evaluate the degree of development and (3) correlate this to the age of the subject based on a reference population. For age estimation based on third molars an automated method for step (1) has been presented for 3D magnetic resonance imaging and is currently being optimised.(Unterpirker et al. 2015)

Aim: To develop an automated method for step (2) based on lower third molars on panoramic radiographs.

Materials and methods: A modified Demirjian staging technique including ten developmental stages was developed. Twenty panoramic radiographs per stage per gender were retrospectively selected for FDI element 38. Two observers decided in consensus about the stages. When necessary, a third observer acted as a referee to establish the reference stage for the considered third molar. This set of radiographs was used as training data for machine learning algorithms for automated staging.

First, image contrast settings were optimised to evaluate the third molar of interest and a rectangular bounding box was placed around it in a standardised way using Adobe Photoshop CC 2017 software. This bounding box indicated the region of interest for the next step. Second, several machine learning algorithms available in MATLAB R2017a software were applied for automated stage recognition. Third, the classification performance was evaluated in a 5-fold cross-validation scenario, using different validation metrics (accuracy, Rank-N recognition rate, mean absolute difference, linear kappa coefficient).

Results: Transfer Learning as a type of Deep Learning Convolutional Neural Network approach outperformed all other tested approaches. Mean accuracy equalled 0.51, mean absolute difference was 0.6 stages and mean linearly weighted kappa was 0.82.

Conclusion: The overall performance of the presented automated pilot technique to stage lower third molar development on panoramic radiographs was similar to staging by human observers. It will be further optimised in future research, since it represents a necessary step to achieve a fully automated dental age estimation method, which to date is not available.

Dental age estimation: evaluation of DNA methylation age predictions

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ABSTRACT

It is known that the ageing process leads to modification of the human tissues and organs. In teeth specific morphological changes were used to estimate age (Gustafsion, 1947). On molecular level changes in the methylation patterns of a set of associated DNA methylation makers (ASPA, PDE4C, ELOVL2 and EDARADD) obtained from teeth enabled to predict age (Bekaert 2015).

The study aim was to establish and evaluate anage prediction method based on DNA methylation and to compare its age outcomes with the results of commonly used dental age estimation methods.

A sample of 75 (41 M / 34 F) fully developed extracted monoradicular teeth was collected in Dental Services Malaysian Armed Forces Dental Clinic (DSMAF). The age of the related subjects ranged between 15.6 and 76.8 year, with a mean age of 41.5 year. The following non-destructive dental age estimation methods were applied: Miles et al. (1963), Bang et al. (1970), Lamendin et al. (1992), Kvaal et al (1994). Therefore, the following parameters were measured: the loss of periodontal attachment, the transparent root dentin, occlusal attrition and the amount of apical root resorption. As dental DNA sources the pulp, cementum and dentin were collected. DNA methylation of the markers (ASPA, PDE4C, ELOVL2 and EDARADD) was quantified in each source and correlated with age. Age prediction models were established and validated. Age prediction performances of the dental and DNA based predictions were compared using appropriate statistics. The study hypothesis is that the age predictions based on DNA methylation markers is providing better age prediction results than the non-destructive dental age estimation methods.

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Age estimation by facial analysis based on applications available for smartphones

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ABSTRACT

For the clarification of civil and criminal liability issues in the identification of living persons as well as dead people the age estimation plays an important role in Forensic Dentistry. The methods of age estimation by teeth have been widely used for these issues because they are conservative, easy, fast, low cost and high reliability methods. The classical methods such as clinical radiographs are used for this purpose. With the advent of technology new methods are being studied and tested so that the age estimation becomes increasingly accurate and fast to execute. Currently the use of smartphones is increasingly common in this digital era. With the advent of social networking and increasing social inclusion the popularization of the use of these devices for face registration, through selfies, and casual smile photographs has been growing every day. The face and the smile are usually the central part of a visual examination. A crucial aspect that impacts the perception of attractiveness is age, since attractiveness and age are often socially related. One way to investigate these aspects without the subjectivity of the human being is to use the applications of cell phones or computers. The aim of this study was evaluate the use of some different apps: "How Old Do I Look? - Age Camera" (Lucky Studio Games, USA), available for the Android system, and "How Old Am I? - Age Camera, Do you look like in the face of Selfie Pic? "(Liu Wang, China), found in iOS software, in the analysis of age estimation and its utilization in forensic dentistry expertise. As well as the factors that influence on image processing for applications such as facial expression change. A sample of 100 individuals, 50 females and 50 males were used. Six photographs were taken in the total of each individual, sitting, in a straight position with white background, being 3 of them smiling and 3 with natural expression. The results show great reliability when used for males, whereas for females there is no equivalent between the actual age and the estimated age. It can be concluded that this procedure can be used as an auxiliary method in estimating age, since it is limited to changes in the facial appearance of environmental and/or genetic origin.

Age estimation using destructive and non-destructive dental methods on an archeological human sample from the poor Claire Nunnery in Brussels, Belgium

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ABSTRACT

Dental age estimation can be performed both in living and deceased individuals. In anthropology, few studies have tested the reliability of dental age estimation methods complementary to the usually applied osteological methods.

Objectives: In this study, destructive and non-destructive dental age estimation methods were applied on an archeological sample in order to compare them with the previously obtained anthropological age estimates.

Materials and Methods: One hundred and thirty four teeth from 24 individuals were analyzed using Kvaal, Kvaal and Solheim, Bang and Ramm, Lamendin, Gustafson, Maples, Dalitz and Johanson's methods.

Results: A high variability and wider age ranges than the ones previously obtained by the anthropologist could be observed. Destructive methods had a slightly higher agreement than the non-destructive.

Discussion: due to the heterogeneity of the sample and the lack of the real age at death, the obtained results were not representative and it was not possible to suggest one dental age estimation method over another.

Dental Age Assessment (DAA) on living individuals for medico-legal purposes – challenges and way forward

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ABSTRACT

Forensic Age Estimation (FAE) on living individuals is done when they are unable or unwilling to provide documentary evidence regarding their date of birth. The criminal responsibility, consent, custodial care, leniency in sentencing are few age related issues that are frequently faced by the law enforcement authorities. Thus in dealing with cases of human trafficking, child labour, sexual exploitation of teenagers, conscription of children in armed conflicts, juvenile delinquency and crime are few instances where FAE may have to be performed. During the recent years the number of individuals who are being referred by the legal authorities for FAE has increased.

There are two methods that are being used for FAE on living individual i.e. social assessment and medical assessment. Social assessment is widely used in UK whilst most of the EU countries and Australia tend to use the medical assessment. Even then there is no uniformity in selecting the parameters for the medical assessment. However the Interdisciplinary Study Group on Forensic Age Diagnostics (AGFAD) recommends the use of a multidisciplinary medical assessment in FAE for medico-legal purposes. Dental age assessment (DAA) is one of the three parameters that have been recommended in the guidelines.

Methods that are used to assess the dental age is of two forms i.e. methods based on the changes that occur in tooth morphology and methods based on tooth development. There is no one method that provides absolute correct dental age. Even though there are recommendations made by the International Organization for Forensic Odonto-Stomatology (IOFOS) there is no uniform practice that has been established to follow in DAA. However DAA can be subjected to strict scrutiny if performed for a medico-legal purpose and challenged in a court of law. Obtaining the consent, selection of an appropriate method, deciding on appropriate imaging modality, interpretation of data, scientific limitations, legislative requirements, documentation and maintaining chain of custody are few ethical, legal and scientific challenges one may encounter in such situation. Therefore developing a standard operating procedure to be adopted in conducting DAA, recommending a standard format to be followed when reporting and having a mentoring system for novices is a timely requirement.

Quality and quality assurance in forensic odontology. International aspects

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ABSTRACT

Quality assurance or quality control is a term coming from the industry. Here it is most important. All products must have minimum quality and variation in size for example must be within certain strict limits. This must be controlled in some way. May be not every single product is controlled, but spot tests must be taken. If not good enough, measures must be taken to improve the quality.

This concept has been transferred to medicine and odontology and also forensic odontology. It has common with industry that certain products are produced. However, they are usually handmade and not produced in an industrial process. In addition, dentistry is a great deal of art and judgement and quality control of these factors may be difficult. In this lecture I will focus on forensic odontology. What are the problems? What can we do and what can we not do? Also how can we assure the quality of both the work, the assessment and conclusion, and the report. I have some personal opinions on that and will give some suggestions.

Quality assurance on an international level is difficult. Conditions and juridical systems are different in different countries. Especially are forensic odontologists different and have different opinions. This presentation will be relevant to the ongoing discussion and attempts at revising the IOFOS' guidelines for quality assurance.

Age estimations of unaccompanied minors in Sweden 2015 - 2016

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ABSTRACT

During 2015, 35.000 minors applied for asylum in Sweden. The situation was chaotic and thousands of cases are still not finalized. Opposition to medical age estimations came from paediatricians and lawyers, and the Migration authorities left over the task to prove their identity, age included, to the asylum seekers themselves. The only competence to do age estimations was FORODONT (my private company).

Since spring 2015 until the end of January 2017 about 900 cases have been handled. Dental (800 cases) according to Mincer et al, 1993, hand (220 cases) according to Schmeling 2006, Clavicle (3 cases) in criminal cases according to Wittschieber 2014.

From the beginning, dental showed around 80% H, 15% G, F and 5% E, D. After changes of practice in the autumn of 2016 the figures changed to 56, 35, and 9%, respectively. Hand development showed 90% 18/19 yrs and 10% 16/17 yrs.

The medical report was givens as the best estimate for each single structure, with their probabilities of being below 18 yrs and probabilities of stated age, and the statistical combination of the structures according to Gelbrich, 2015. The limits of the probabilities were left to the receiver of the report to set.

The result was the presented to the applicant, his good man and his lawyer which then used it after their own judgement. It is unknown how many of the reports which were presented to the Migration authority.

The age estimations have now been taken over by the National Board of Forensic Medicine after request from the Migration authority. The structures to be studied are wisdom teeth radiologically and the lower distal part of femur (knee) with MRI.

A big study with some 2000 participants is to be started to confirm the reliability of the MRI.

Age estimation of unaccompanied minors in the Nordic countries

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ABSTRACT

Introduction: Due to wars and other conflicts around the world, the numbers of asylum seekers in the Nordic countries in recent years have risen. In 2015, EU countries received 88,700 applications from unaccompanied minors and of all the applicant minors, 23% were unaccompanied, more males than females. Human rights have been guarded for children through international regulations where the most important one is the UN Declaration of the Right of the Child. The legal system seeks assistance from forensic odontologists in age estimation for this age group. Tooth formation is less disturbed by various diseases, nutritional or hormonal factors than other biological growing factors and is therefore more accurate for age estimation than other measurable growth criteria in the body.

Material and methods: Method for age estimations in the Nordic countries were collected by contacting forensic odontologists responsible for dental age estimation in each country. Questions were submitted for them asking what methods are used and if the conclusion is presented with mean and standard deviation. Is skeletal age as hand and wrist radiography used and who is responsible for the analysis?

Results: Dental age estimations are based on one to three of the following methods: Haavikko (1970), Liversidge (2008), Mincer et al. (1993), Köhler et al. (1994). Nyström et al (2007), Kataja et al. (1989), Chaillet et al. (2005) and Willems et al. (2001). In Finland QMUL atlas is also used. In all countries except Iceland, hand and wrist radiography based on Greulich and Pyle atlas (1959) is used and in Finland forensic odontologists perform the analysis. All age estimations are performed in public institutions except in Sweden where a private company is responsible for the analysis. In Sweden an Excel program producing pooled probabilities of tooth and hand examination in graphics are used combining wrist age and third molars in forensic age estimation to calculate the joint age estimate and its error rate in age diagnostics. All countries except Norway present the conclusion with mean and standard deviation.

Conclusion: Although methods of age estimation in the Nordic countries differs, they are based on scientific evidences, methods recognized by the international scientific community.

Age assessment of young Somalians, born and living in Finland

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ABSTRACT

The first Somali asylum seekers arrived in Finland in the early 1990's following the mayhem of the civil war in Somalia. In 2015 there were 17,871 Somalis in Finland, and of all forensic age assessments performed in Finland, the Somalis represented the third most common ethnicity. At the moment, there are no dental development reference tables for Somali origin. The aim of the current study was to determine the dental development schedule of young Somali in order to establish a reference for forensic age assessment. This will be addressed by investigating young Somalis, born and living in Finland. Since dental development is extensively genetically regulated and little influenced by external factors, the approach will give applicable results regardless of place of birth or living. All individuals to become included were born in Finland after 1.1.1980, their both parents were born in Somalia and spoke Somali as their native language, and their permanent address was in Helsinki. According to the Finnish Population Register Centre, 2,115 persons fulfilled the above criteria. From this population 1,231 dental panoramic radiographs were found from 810 persons (413 females and 397 males) in the division of Oral health care of the Department of Social Services and Health Care in Helsinki. The age at radiography of the sampled subjects ranged between 3 and 23 years. The two specialist evaluating the X-rays were calibrated and the intraobserver error measured.

Methods:

- The development of all available wisdom teeth was staged according to Kohler et al. (1994). The development of the seven lower left permanent teeth (31 to 37) was staged according to Demirjian et al. (1973).
- A degree of third molar development was established for each subject using a Bayesian estimate of the random effect. It can be interpreted as its score on a latent factor underlying and summarizing the developmental stages of the four third molars.
- A Bayesian third molar age estimation model for the multivariate distribution of the stages conditional on age was established (Thevissen, Fieuws et al. 2010).
- A Bayesian permanent tooth age estimation model for the multivariate distribution of the stages conditional on age was established.
- The established models were validated and their age prediction performance quantified (Thevissen, Alqerban et al. 2010).

Modification of age estimation techniques among children from Transcarpathian region

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ABSTRACT

Age estimation in forensic medical practice based on the analysis of the skeletal elements that develops and forms due to specific age features or progressive processes that are quite slow and goes on periodically in order, and so can be used as a reliable indicator for age identification criteria.

During the testing of radiographic dental age estimation methods on a sample of 188 panoramic x-rays of children aged from 4 to 16 years, who were treated previously at the University Dental Clinic, it was found that the proposed approaches of Haavikko and Demirjian characterized by significant levels of absolute errors in the range of 0.79 -1.56 years. This fact indicates the need for modification of the standard calculation algorithms to minimize data variation parameters and calculate the parameters for proximization of dental age due to valid passport criteria.

Given that the rate of Pearson correlation between the intermediate data of tooth-jaw apparatus formation by Demirjian and final results determined by the method of Haavikko was argumented, we provided specific regression equation based on standardization statistic principle of all values calculated among children's orthopantomograms from Transcarpathian region. By use of this equation in the age group of 4,0-4,9 years the value of absolute error was reduced to 0,136 years, compared with 0.46 and 0.64 for Haavikko and Demirjian respectively, in the age group of 5,0-5,9 - to 0.219 years compared with 1.26 and 0.72 for Haavikko and Demirjian respectively, in the age group of 6,0-6,9 - up to 0.09 years compared with 1.03 at 0.71 for Haavikko and Demirjian respectively, in the age group of 7,0-7,9 years - for 0,021 years, compared with 0.85 and 0.75 for Haavikko and Demirjian respectively, in the age group 8,0-8,9 - to 0.168 years compared with 0.57 for Haavikko and Demirjian respectively, in the age group 9,0-9,9 - up to 0,074 years, compared with 1.13 and 0.8 for Haavikko and Demirjian respectively, in the age group 10,0-10,9 - to 0.205 years compared with 0.46 at 0.66 for Haavikko and Demirjian respectively, in the age group 11,0-11,9 - to 0.284 years compared with 0.46 per Haavikko and 0.8 per Demirjian, in the age group of 12,0-12,9 - for 0,075 years, compared with 0.7 and 0.6 for Haavikko and Demirjian respectively, in the age group 13,0-13,9 - to 0.189 years compared with 0.7 per Haavikko and 0.8 per Demirjian, in the age group 14,0-14,9 - to 0.306 years compared with 0.39 at 0.71 for Haavikko and Demirjian respectively, in the age group of 15,0-15,9 - to 0.12 years compared with 0.9 and 0.84 for

Haavikko and Demirjian respectively, in the age group of 16,0-16,9 - to 0.252 years compared with 0.51 and 0.69 for Haavikko and Demirjian respectively.
The complexity of mathematical calculations performed during the age evaluation of children, which includes the conversion stages of qualitative variables into subsequent quantitative data of the interim ratios argued the feasibility to develop semi-automatic form for calculating the age of the person using the computer application software. Prototype of this form have been developed for Haaviko, Demirjian, Cameriere, Willems, Kvaal, Cameriere (for adults) methods in Microsoft Excel 2016 (Microsoft Office 2016) software. The basic principle of operation of the proposed algorithm is that the operator enters into the corresponding cells of editor only the raw data, such as formation level, radiological parameters of the pulp and tooth length and width parameters depending on the protocol of the original stages for each of the technique. Then the program automatically publishes final figures of dental age range and all variances of absolute errors from the smallest to the largest.

The accuracy of the London Atlas of Human Tooth Development and Eruption in dental age estimations of Saudi, Spanish, and Italian children

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ABSTRACT

Schemas of dental development are used frequently to assess maturity and estimate dental age, yet there are still scarce evidence on their accuracy when used in different populations. The aim of this study was to test and compare the accuracy of The London Atlas of tooth development (1) when used for dental age estimation in Saudi, Spanish and Italian populations.

Materials and Methods: The sample consisted of 400 Saudi, 400 Spanish and 300 Italian males and females between the ages 6-15 years. Inclusion criteria were good quality, clear panoramic dental radiographs (OPGs) of healthy patients with no medical history of systemic diseases/disorders. Exclusion criteria were: unclear radiographs, hypodontia (one or more missing teeth), Hyperdontia (one or more extra teeth), Gross pathology (Torodontism, microdontia, AmelogenisisImperfecta, DentinogensisImperfecta, tumors, abscesses, fractures, etc.), presence of gross caries or previous orthodontic treatment. Age estimation was done using The London Atlas of Tooth Development and Eruption on the left side of both upper and lower jaws by direct comparison with the diagrams.

Chronological age (Real Age) was blinded from the researchers up until all radiographed were assessed and age estimation was completed. All data managed and analyzed using SPSS program (v24). Inter and Intra-examiner reliability test were done on a random 10% sample from the radiographs using kappa.

Results: Intra-examiner reliability test was (0.9) and the Inter-examiner reliability test was (0.87), which shows excellent agreement.

Mean difference between Estimated Age (EA) and Real Age (RA) in all populations combined was 0.21 years with Standard Deviation (SD) of 0.978 years and absolute mean difference of 0.645 years.

The Saudi population showed the mean difference between EA and RA to be 0.247 years (SD 0.769 years) with no Bias (p 0.08) and the absolute mean difference was 0.620 years. The Spanish population showed the best mean difference (0.099 years) but with the largest SD (1.09 years) with no Bias (P 0.071) and the absolute mean difference was 0.857 years. Whereas in the Italian population the mean difference was 0.451 years with a standard deviation of 0.965 years with positive no bias (P 0.006) and the absolute mean difference was 0.782. There were no statistically significant differences between populations.

Conclusion: The Atlas of Tooth Development is applicable to the Saudi, Spanish and Italian populations with good measures of accuracy.

Orthodontic records as source of morphological dental identifiers: an uncommon forensic case report

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ABSTRACT

Procedures related to the identification of charred, putrefied and skeletized bodies are performed routinely in Brazilian medico-legal institutes as a reflection of the high rates of violent deaths of the country. Forensic Odontology plays an important role in human identification especially when the antemortem (AM) dental records of the missing personare available. Orthodontic records, such as photographs, radiographs and dental casts, provide information useful for identification purposes because it may reveal important morphological, therapeutic and pathological dental identifiers. During the orthodontic treatment, several dental traits may be modified in the search for optimal aesthetic and functional outcomes, such as the alignment of crowded teeth. These therapeutic corrections may constitute explainable differences found during the human identification exam. However, the human identification may rely in other identifiers for more reliable outcome. Among these identifiers, the brand, type and position of orthodontic appliances figure as distinctive tools for human identification. In this context, the present study aims to report an uncommon case of identification of a putrefied bodie, found near to a forest region in the State of Goiás, Brazil. The postmortem (PM) exam showed that the victim had two teeth missing PM, while all the remaining teeth were sound. Additionally, the victim had part of a fixed orthodontic appliance installed in the maxillary and mandibular dental arches. To identify the bodie relatives of the potential victim presented orthodontic exams containing panoramic radiography and photographs of the orthodontic treatment. The body was identified based on the analysis of the radiographs and photographs that confirmed the presence of the orthodontic appliances observed PM. More specific, the identification was supported by the analysis of bracket bonding position of the maxillary and mandibular incisors and the presence of distinctive morphological traits of the canines and incisors, as well dental roots observed radiographically. The present case report highlights the importace of orthodontic records as source of morphological dental identifiers for cases in which only sound teeth are available.

Odontological identification without teeth

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ORAL PRESENTATION

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ABSTRACT

The importance of including all information on the dental status of a missing person in the repository of the missing people became evident when only few skeletal remains were found in 2015 in a wooded area in Sweden between the cities of Norrtälje and Uppsala. Among the remains, apart from a few assorted bones there was a human skull. The alveolar bone was missing and there were no teeth in the vicinity of the find. However, a partial upper denture was present near the skull.

The quality of the denture showed that it was apparently of Scandinavian origin and it had been fitted on four teeth in the first quadrant and on two teeth in the second quadrant. The teeth present would have been 15, 14, 13, 12, 23 and 24. The anthropological features of the skull pointed to the deceased being a female. A search of the Swedish repository of the missing persons and unidentified bodies, compiled in the DVI System International data program, yielded a missing woman who had disappeared in 2008 from the city of Uppsala. Among other features she had had a partial denture in the upper jaw that had been fitted to the same teeth as the recovered denture.

As there was a tentative missing person to investigate, a DNA comparison was made between the skeletal remains and the two sons of the missing woman. The results showed that the bones had belonged to a person who was clearly strongly related to the compared men. The probability of her being their mother was at 99.99%.

This case illustrates the importance of including all dental information, such as dental records and dental radiographs, into the files of the repositories of missing persons.

Terrorist truck attack in Nice on the 14th of July 2016: Disaster Victim Identification

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ORAL PRESENTATION

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ABSTRACT

On the 14th of July, around 11 pm, a truck rammed into the crowd who were gathered on the Promenade des Anglais in Nice to watch national day fireworks. The driver hit all the people in his way, killing 86 people, including 17 children and injuring more than 400 people according to the status report in august 2016. Twenty-four foreign victims represented 16 different nationalities. The attack was claimed by DAESCH.

A well-staffed forensic odontology team was rapidly set up to deal with the emergency identification and allow a non-stop work schedule during the 3 days after the terrorist attack. These French forensic odontologists with different skills and experiences proved to be mutually reinforcing.

Two separate protocols were developed: one for identification and one for autopsy to be more efficient.

Forensic Dentists participated in both the Post-Mortem team at Nice Hospital and in the Ante-Mortem team where the victims' families were received. They also examined the unconscious victims' dentitions. Then, in the reconciliation dental section, they conducted comparisons, established identifications and prepared expert opinions for matches.

One or two identification commissions were organized every day, effectively putting "a go with the flow" policy in place, as new matches emerged; six identification commissions took place in total. One dentist participated in each of them.

The results of the different identification methods and these new organizational procedures will be laid out in the presentation.

Identification of victims charred in the road accident of Puisseguin (France)

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ORAL PRESENTATION

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ABSTRACT

The present communication shows the value of applying a strict protocol for different phases of charred victims identification.

Whatever the degree of carbonization, it is observed that the dental system is well protected by soft tissues and hard tissues that surrounds him and the teeth have particularly good resistance to fire thanks to their high degree of mineralization. The high temperatures and direct action of the flames, however, have a destructive effect. It follows from these findings that the dental system is the material of choice for the identification of charred victims while in extreme carbonizations the use of DNA analysis became impossible.

Comments carbonization phenomenon have clarified the procedures for identifying charred victims.

Several studies have led to the establishment of a classification of the degrees of carbonization of the head and teeth and the drafting of examination protocols for each degree of carbonization (Georget, Conigliaro and Schuliar – 2014).

the techniques used to preserve the maxillaries, to exam dental arches, to photograph and to radiograph the heads of charred victims are specific to each victim as in the same accident, charring differs with exposing victims to the flames.

After explaining the establishment of appropriate protocols for dental identification of charred bodies in disasters, the authors present the identification work carried out during the Puisseguin (France) road accident on October 23, 2015, which killed 43 people.

Finaly, the results reveal that the percentage of dental identifications on the charred victims is high and this type of identification should always be performed in first intention.

Data synthesis was carried out by the Forensic Medicine and Forensic-Odontology Department of the Institute of Criminal Research of the French National Gendarmerie during dental examinations within the Gendarmerie Unit of Disaster Victims Identification at disasters.

Helicopter crash in Argentina

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ABSTRACT

Two helicopters crashed into each other at an altitude of 80 meters whilst filming a French TV reality show («Dropped»). They caught fire and burned for six hours with no survivors.
Among the 10 victims were two Argentinian pilots and eight French citizen: one journalist, four cameramen and sound engineers and three very famous sports personalities.
There was a large amount of media coverage about this catastrophe both in Argentina and in France.
A post mortem team composed of one forensic doctor and one forensic odontologist was immediately sent on site while the ante mortem team was working at the IRCGN in Rosny-sous-Bois (with three forensic odontologists). The odontological findings will be presented.

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ORAL PRESENTATION

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Portuguese militar air crash accident: dental identification of the victims

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ORAL PRESENTATION

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ABSTRACT

Introduction: The positive identification of skeletal by individual dental parameters is one of the objectives of the criminal investigation. The intervention of Forensic Dentistry in some circumstances may represent the only way to obtaining a positive identification of an unidentified bodies. The teeth constitute a scientific method in forensic identification, principally due to the great resistance to the agents who provoke the destruction of the soft tissues in the corpses (putrefaction, traumatic, physical and chemical agents) and to the high morphological variability of the human teeth. The human identification in Forensic Dentistry is made by two ways: comparative and reconstructive. The identification allows determining several parameters of forensic interest: specimen, population affinity, sex, age, stature and individualization's factors. The Forensic Dentistry is one of the most important fields in individual identification, because teeth have less variability in the chronology of events in terms of the reconstructive way. On the other side, in terms of the comparative way, this area is also important, because of the individualization's factors: positive identification in individual cases and in mass disasters. In this forensic case report, air crash accident case, the objective of the medico-legal investigation was a positive identification of the 3 unidentified carbonized corpses found inside the military airplane. The Portuguese law investigation department requested a forensic examination by a Forensic Odontologist for dental positive identification. The objectives were: 1) post mortem reconstruction of the dental status of the victim; 2) obtain the ante mortem information of the presumable victims; 3) comparison of the post mortem information with the ante mortem information, for a positive identification of the presumable 3 victims. Materials and methods: in this field of dental investigation, the guidelines of the International Organization of Forensic Odontology were used for reconstruction of the post mortem dental profile, to register ante mortem information of the presumable victims and to compared for individualized dental factors, by using Interpol DVI Forms dental post mortem and ante mortem forms.
Results: the 3 carbonized unidentified victims were positive identified where it was established the identity by more than 12 individual dental characteristics in less than 24 hours.
Discussion and Conclusion: the Forensic Dentistry is a very important and simple field for individual identification of unidentified corpses in a short period of time to deliver the corpses to the family.

Dental aspects of the Brussels terrorist attacks

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ORAL PRESENTATION

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ABSTRACT

The Brussels terrorist attacks of 22 march 2016 required a thorough DVI management as the circumstances were extremely difficult. Two different locations and two open disasters did not simplify the task of the DVI teams, especially since the victims came from different countries and continents. Collecting the AM information in due time was a key factor to identification. Odontology proved to be a major primary identifier in the victim identification process, allowing us to identify most of the victims within 4 days after the attacks. An assessment of the different challenges in the odontology section will be discussed and the lessons learned will be shown. Implementation of the results of this odontological assessment should lead to even an even better working flow and quicker results in the future

Estimation of stature with the help of radiographic tooth length

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POSTER PRESENTATION

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ABSTRACT

Background: Stature is fundamental in personal identification for forensic and physical anthropology. When a full skeleton is not available, stature can be estimated from incomplete human remains. Teeth form an excellent material for anthropological, genetic, odontologic and forensic investigations. However, there is no research work on correlation between stature and tooth length on Indian population. This study has been undertaken to see the possible correlation between the teeth length and the height of the individual.

Objective: To compare and correlate the tooth length (radiographic) with the stature of individuals.

Methodology: The sample comprised of dentitions from 60 individuals (30 females and 30 males), all young adults between 20 and 30 years. Height will be measured as the vertical distance from the vertex to floor. Orthopantomogram (OPG) will be taken to evaluate the tooth length of all the teeth except 3rd molars. The tooth length will be measured in digital OPG, using software [PLANMECA].

Results and Conclusion: Correlation analysis revealed that all the tooth length variables had a low, albeit, statistically significant correlation to stature. This indicates that the tooth length may be used as a parameter in estimating stature, when there are no long bones available, which are better predictors of height.

Cephalic index and facial index of modern Dayak Kenyah population of East Borneo

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POSTER PRESENTATION

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ABSTRACT

Background: Facial reconstruction is beneficial in forensic identification process. Craniofacial measurement can determine various forms of heads and faces that is useful for individual identification in forensics. Dayakid is one of the morphotypes in Indonesia. Dayak Kenyah population is one of the Dayakid morphotypes living in Borneo and developed in isolated condition, so it has different morphological characteristics compared to other population. At the moment, the morphology of the head and face of Dayak Kenyah population in urban area is still unknown. Dayak Kenyah tribes is scattered throughout Borneo Island, and one is at the outskirt of Samarinda, capital city of East Borneo. As far as the development and environmental and socio-cultural changes concern, it will followed by physical changes due to the adaptation process.

Purpose: The study is to obtain the characteristic of craniofacial morphological pattern of Dayak Kenyah population in East Borneo living in urban area as the individual identification device in forensic.

Methods: The sample for this study used simple random sampling method were thirty five subjects from Dayak Kenyah Population in East Borneo who met the inclusive criteria. The measurements were on eu-eu, g-op, n-gn and zy-zy. Data analysis was followed by statistical test.

Results: The mean of cephalic index was 81.18 ± 5.6 and facial index was 71.86 ± 11.0. The dominant type of head shape for Dayak Kenyah Population was mesocephalic (31.42%) and the second type was brachycephalic (22.85%). The dominant type of facial shape was hypereuryprosop (57.14%) and the second type was euryprosop (37.14%).

Conclusion: This research has shown that shape of the head of modern Dayak Kenyah population are predominantly mesocephalic and have face from hypereuryprosopic to euryprosopic.

Comparison between bone and dental methods for stature estimation in unknown skeletons

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ABSTRACT

The identification process should be developed in an objective manner and in conjunction with the availability of resources and training of the multiprofessional expert team, who works to examine the possible characteristics of individuals who can assist in the search for the identity. The establishment of the human anthropological profile contains several parameters, including stature. Stature estimation is performed mostly from measurements of long bones and by applying regression equations that depend on the previous evaluation of the sex and the ancestry, in this way, the use of such formulas is of greater utility in countries with well-defined racial groups, which does not apply to Brazil due to its crossbreeding. Thus, Carrea (1920) developed a method based on the proportionality of dental dimensions to human stature, which may be an alternative in the process of estimating height. The objective of this study was to evaluate the level of agreement between bone and dental method for the stature estimation in unknown skeletons. For this, the sample consisted of 40 unknown cases that were sent for forensic anthropological exam. It was concluded that the level of agreement between the bone and dental method was considerable for 50% of the sample. Among the results, most showed that in the dental method, the interval between the minimum and maximal stature was higher than expected for identification of forensic cases.

Forensic dentistry in bioarchaeology

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POSTER PRESENTATION

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ABSTRACT

As bones and teeth are usually the only surviving direct source of biological information from past human groups, which did not maintain written records, the study and analysis of the information derived from dental tissues in the archaeological material have a crucial role in paleodemography and paleopathology research and the subsequent understanding of past population lives.

The teeth of the skeletal remains are typically evaluated regarding the presence of dental pathology markers (decay, periodontal disease, dental calculus, tooth wear, antemortem tooth loss). The evaluation is performed by the use of macroscopic and microscopic methods but also biochemical analysis, allowing the reconstruction of the diet and the dietary variation between different population subgroups defined by age, sex or social status as well as possible changes throughout the examined period.

The scope of this work is to highlight the application of dental bioarchaeological techniques to the archaeological skeletal samples, which enable the development of demographic profiles for the examined historic settlements, covering aspects such as the population's composition, continuity and immigration, the social structure, the position of women and children, the dental health and diseases.

Role of lips print for forensic investigation

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POSTER PRESENTATION

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ABSTRACT

Identification plays a major role in any crime investigation. Lips prints often appear on straws, glasses, cigarettes, and others. All of these are potential places where lip prints may be found and used in the investigation of a crime. Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lips traces. In the past decades, lip-print studies attracted the attention of many scientists as a new tool for human identification in both civil and criminal issues. Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin. A lip print may be revealed as a surface with visible elements of lines representing the furrows. This characteristic pattern helps to identify the individuals since it is unique for individuals. Lip print recording is helpful in forensic investigation that deals with identification of humans, based on lip traces

Signs of elder abuse to be paid attention by dentists: Bottle tooth decay in an elderly person suspected of being neglected

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POSTER PRESENTATION

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ABSTRACT

We encountered the unnatural death of an elderly person with dental findings not normally found in the elderly, being a suspected case of neglect. We are planning to report this case to promote cooperation for the prevention of elder abuse by dentists.

The deceased patient was an 83-year-old female who had been brought by her family to a nearby hospital for severe weakness but died the following day. Since it was a suspected case of neglect, the police were notified of it as an unnatural death by the physician who examined her. On medico-legal autopsy of the whole body, emaciation was marked and many pressure ulcers were present on the back and buttocks. In the oral cavity, multiple acute dental caries were noted only in the upper front teeth. There were no caries in the lower front teeth, and the findings were similar to those of bottle tooth decay in infants. Marks of appropriate prosthetic treatment were noted in the upper and lower molar regions. Based on autopsy, the cause of death was judged as undernutrition-associated pulmonary edema. The deceased person had no medical history of dementia. According to her family, they had fed her gelatinous nutrients using a straw, but she did not appear to have received sufficient medical care or welfare support. Based on the state of dental caries observed, she may have been fed like infants, developing bottle tooth decay, and, as judged from the whole body findings, the nutrition had been insufficient, suggesting that insufficient nursing care had let to malnutrition. The autopsy findings also strongly suggested that she had been neglected, but the police did not conclude that this was a case of abuse.

Screening dentists' competence in recognizing and responding domestic violence victims: a preliminary study

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POSTER PRESENTATION

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ABSTRACT

Introduction: Domestic violence is a silent cycle of physical, emotional and verbal abuse that affects victims physically and emotionally. Anyone may be a perpetrator or a victim regardless of race, ethnicity, socioeconomical class, age, sexual and gender identity although usually incidents of domestic violence are perpetrated by men against women. Since most of the victims sustain injuries in the head and neck area, it is crucial for all dentists to be aware of the signs and symptoms of domestic violence. Dental staff's contribution is of a major importance since they may motivate patients to seek for help before life-threatening injuries occur. However a small number of dental professionals are able to detect and report cases of abuse due to minimal training or lack of knowledge and awareness.

Purpose: The purpose of this study was to appraise the competence of Greek dentists in recognizing and responding domestic violence victims.

Material and methods: An anonymous identical questionnaire was completed by 50 dentists. Demographic characteristics of all the participants as well as years of practice were collected and categorized. In order to appraise their knowledge and ability to detect and report domestic violence injuries the respondents were asked several questions. In particular questions concerning the location, differential diagnosis, documentation and respond of the injuries were asked. Moreover dentists' awareness of patient's motivation to seek for help and support was evaluated. Statistical analysis of the data performed with STATISTICA 10. Software.

Results: The majority of the dentists were aware that victims sustain injuries in the head and neck area. A high percentage of dentists consider themselves unable to detect signs of domestic abuse, and only few of them have reported or referred those cases.

Conclusion: Dentists in Greece should be better educated in relation to domestic violence victims screening. Adequate knowledge concerning handling of such cases should be provided through continuing education courses.

Domestic child homicide – the final step of systematic physical abuse and neglect or a separate entity? A population-based study of child homicides in Sweden 1998 - 2012.

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POSTER PRESENTATION

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ABSTRACT

Despite a fundamental right for all children to live and grow up in safe and nourishing environments, millions of children worldwide are subjected to abuse, neglect and fatal violence. During the past decades, numerous scientific publications on physical child abuse and neglect has contributed to a profound knowledge about associated individual, contextual and situational risk factors. Contradictory, the nature of the most serious form of child violence victimization, homicide, is far less explored. Furthermore, little is known about the correlation between different forms of violence towards children. Regarding the relation between child abuse and child homicide there is no consensus whether child violence represents a continuum ranging from mild physical punishment to serious and lethal violent actions or if child abuse and child homicide represent two different entities with their own set of underlying factors.

The primary aim of this population-based study was to explore the nature of child homicides in terms of epidemiological, contextual, situational, forensic medical and crime scene findings (i.e. evidential signs of criminal violence including previous abuse and neglect at the body and at the crime scene). Police reports, including crime scene and autopsy protocols of child homicides occurring 1992 to 2012 in Sweden were collected and reviewed according to a standardized protocol. A total of 53 cases with 61 victims (25 girls/ 36 boys aged 0-14) were included and reviewed with special focus on epidemiological, forensic medical and crime scene variables. The data was presented using descriptive statistics.

The annual frequency of child homicide offences was 4.0 cases (4.6 victims). A majority of the cases, 79%, were intrafamilial in nature and most commonly committed in the parental home (n=40). Suicide by the perpetrator occurred in 17 incidents (27%). A majority of victims displayed visual injuries (73%). Most children (89%) died from an immediate killing action, most frequently asphyxia and sharp violence (n=16 and n=15 respectively). Signs of neglect and abuse prior to death was present in 24% of the cases (n=10). Active efforts by the perpetrator to mislead the investigation followed 25 children´s death (61%) and in two cases (3%) the crime scene had been staged to mimic another type of death but homicide (accident or natural).

The results of this study show that child homicidal acts in most case are committed by a parent by a concentrated and

irreversible killing act, that the homicidal act may be followed by suicide by the perpetrator and that systematic and escalating abuse and neglect prior to the killing act was unusual in the selected population. This might indicate that child abuse and child homicide represent different causal mechanisms, such as motivational factors. However, which specific traits that characterizes child homicides and how this ultimate form of child violence is related to other, less violent forms, needs to be further elucidated.

Dental patient negligence and malpractice: a case report and a literature review

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POSTER PRESENTATION

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ABSTRACT

Introduction: Dental malpractice and patient negligence are two different related issues. Both malpractice and patient negligence may be a consequence of dentists' lack of knowledge, experience or professional attitude and high workloads. In recent years the number of malpractice lawsuits against dentists has been increased.

Objective: The purpose of this study is to present a case report concerning dental malpractice and negligence and perform a review of the current literature.

Case presentation: A 52 year-old female patient was referred to the Department of Oral Diagnosis and Radiology, Dental School of Athens by her dentist after he had failed to treat her effectively. In particular, the patient visited her dentist 5 ago complaining of persistent and intense pain in the nasolabial line, the upper lip, the temporal area, the left ear and the floor of the orbit just above the left maxillary canine. Her dentist performed a panoramic x-ray and according to his diagnosis the upper left lateral incisor considered the cause of the pain due to an extensive dental composite restoration. The dentist proceeded in endodontic treatment of the responsible tooth. However, five months later the pain had not subsided and the patient was referred by her dentist to additionally perform, four additional radiographic examinations (a Waters view radiography, a lateral cephalometric radiography, an Ultrasound and a Computed Tomography). After evaluating of the data accrue from the patients' complete and detailed medical history and the findings from the clinical and radiographic examination the diagnosis was an atypical neuralgia. So the patient was referred to a neurologist psychiatrist for further evaluation.

Discussion: In this case the dentist provided his patient with a treatment below what would normally be expected of an experience dentist. In particular he misdiagnosed the patients' problem, performed a wrong and unnecessary treatment and performed several inadequate radiographic examinations, exposing the patient in radiation unseemly. Dentists should always keep in mind that they should comply with the appropriate standards and protocols during practice. Moreover they are obligated to act in accordance with the laws of the country they practice and adhere to ethics.

Torture victims: an Italian sample study and forensic issues

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ABSTRACT

The irregular immigration towards European Countries is a well known phenomenon that has dramatically increased over the last few years. Consequently, several legal-medical issues have also been on the rise. Forensic investigations are often required by institutions responsible for releasing asylum and inter/national protection. Forensic and medico-legal experts are called to face with cases of irregular immigration for two main and important questions: age estimation in unaccompanied minors and medical investigation in case of declared to be victim of torture of violence. In Florence, a specific medico-legal service has been activated in 2014 at the Local Medico-Legal Service of National Health System for providing medico-legal reports in case of alleged tortures or violence. The medico-legal protocol for torture ascertainment, the epidemiological data resulted from about 120 reports will be presented and discussed with particular attention paid to the victim's history and clinical signs emerged during the interview and the visit. Some specific physical consequences and signs, especially those affecting the maxillofacial and oral areas will be discussed for the relevant role that a forensic odontologist can assume in such specific ascertainment. The experience highlights the difficulties of these medico-legal assessments which link both the necessary multidisciplinary nature and legal medical or forensic methodology which requires the practitioners to undergo special training based on international protocols

Third molar cut-off value in assessing the legal age of 18 in Saudi population

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POSTER PRESENTATION

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ABSTRACT

Teeth plays a major role in forensic sciences especially in age assessment of an individual, which can be used to aid in criminal or civil matters. The importance of teeth comes from their ability to survive inhumation well and because they are hardly affected by exogenous and endogenous factors. Third molars are the only teeth still developing after the age of 14 years and during the legal age of adulthood, which is 18 years. The consequences of criminal violation can strongly affect the individual's life, it is important to set different parameters to decide whether an individual is a minor or an adult in the absence of documents. Depending on the different legal requirement, such parameters can set above 90% probability for criminal matters and from 51% to civil matters.

Aim: The aim of this research was to find the cut-off value of third molar development for the legal age of 18 amongst Saudi individuals using the third molar maturity index method by Cameriere et al., 2008.

Materials and methods: This was a cross sectional study on 300 archived Orthopantomogram (OPG) of healthy Saudi patients between the ages 14 and 22 years attending the Dental Hospital at King Saud University, Riyadh, Saudi Arabia. All OPGs were taken by PLANMECA - ProMax machine and evaluated by the Romaxis software. The inclusion criteria were good quality OPGs taken during the course of treatment. All patients were healthy with no systemic diseases or disorders with the presence of third molars and clear root apex.

The lower left mandibular third molar (LL3rd M) was assessed using third molar maturity index (I3m) to determine if the individual is younger or older than 18 years old.

Results: The cut-off value of I3m for the Saudi population was (I3m < 0.08). The sensitivity of this method was 51.7% and the specificity was 98.5%. Early mineralization was found in males except when I3m was ranging from (0.0 - 0.4) and (0.9 - 1.7). Cameriere et al. test was reproducible with good measure of reliability.

Conclusion: This method is suitable for assessing the attainment of legal age of adulthood in Saudi population and the cut-off value of I3m is similar to other populations. Although dental age assessment by means of third molar development is useful, it still has its limitation because of its variation in position, morphology and development.

Age estimation using root dentin transparency in Thai population

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ABSTRACT

Objective: The objectives of the study were to find the relationship between chronological age and root dentin transparent zone in Thai population and to compare the chronological age with age estimated by Lamendin's formula.

Materials and methods: The samples consisted of 47 single rooted teeth (23 males and 24 females between 20 to 79 years old (mean 52.47, SD. 18.485). The measurement method was based on the method published by Lamendin et al.. Linear measurements of the root transparency zone, periodontosis and root length were done on the labial surfaces of teeth by four calibrated observers. The percentage of the transparency zone was defined as T and the percentage of the periodontosis was defined as P. Ages based on Lamendin's formula were calculated. Statistical analysis was done using the SPSS statistical software package. Inter- and intra-observer agreement was evaluated using intraclass correlation coefficient (ICC). Linear regression was fitted with the data from the present samples.

Results: No statistically significant differences ($p<0.05$) were found between genders, upper and lower teeth, anterior teeth and premolars, and among 4 tooth groups. The mean age difference between chronological age and age estimated by Lamendin's formula was -3.35 (SD. 14.04) year. The lowest age difference was found when the subjects were between 50 and 59.9 years old (-1.18 (SD. 6.53) year). A linear regression formula was generated for the present samples as: Age (A) = 17.769+(0.476P)+(0.506T) with $r^2 = 0.472$, standard error of the estimate = 13.74. ICC showed good to excellent intra-observer agreement (ICC 0.96-0.99) and also inter-observer agreement (ICC 0.80-0.97).

Conclusion: This research has provided useful information about the dental age estimation of Thai population using root dentin transparency. The regression formulae can be useful for age estimation of Thai population after tooth development is completed.

The comparison of Demirjian and Kohler third molar classification for Indian ethnicity in Malaysia

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ABSTRACT

Malaysia has continuous influx of illegal worker and refugees without legal documents from various part of Indian continents (e.g. Bangladesh, Sri Lanka & Nepal) which many cases been referred to the Forensic Odontology Unit of Kuala Lumpur hospital for age assessment. In assessing the refugees, the chosen method for the assessment should be efficiently and accurately assess children with minimum risk of wrong diagnosis a minor as an adult. Also, a great number of unknown bodies without legal documents presumed to be of those coming from the Indian continents were referred to the Forensic Odontology Unit of Hospital Kuala Lumpur for age assessment as part of the identification process. This retrospective cross-sectional study aims to test the Kohler (1994) and Demirjian (1973) third molar classification system on the Malaysian Indian ethnicity for the attainment of the age of majority which is 18 years old. A number of digital and conventional orthopantomograms (OPG) of Malaysian patients from the Indian ethnicity aged 13 to 23 when the OPG was taken for diagnostic purposes were collected by convenience sampling from multiple oral surgery, orthodontic and paediatric dental clinics across the peninsular of Malaysia. Date of birth, nationality and ethnicity were checked from identification card of patients and their parents (for the paediatric patient). The inclusion criteria included those with at least one non-impacted, non-pathological third molar with no medical history to indicate any disturbance in dental development. A modified Kohler (1994) classification is proposed for guidelines. The OPGs are anonymised, blinded and randomised. The OPGs are being examined and scored by the first examiner for all the present third molars using the Kohler (1994) classification system followed by the Demirjian (1973) system. After some period, a number of OPGs will be randomly selected for inter-observer and intra-observer reliability for both methodologies. Data will be statistically analysed for the difference in discriminative capability of attaining the age of majority for the Indian ethnicity in Malaysia. Hypothetically, if the outcome is comparable to the two system and with other studies in the discriminative capability of the legal age, using both systems may increase clarity and accuracy in providing a legal opinion for the attainment of adult status to minimise the risk of overestimating the age of a child. Also, the result of this study can be used both on the living person and dead bodies.

The irony of age estimation in an edentulous subject by dentists, and methods and techniques used in such a case

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ABSTRACT

This poster presents an unusual case of an adult, completely edentate, female subject who presented to a dental school for age estimation. Specifically, age assessment was necessitated to claim retirement benefits and the request made was to determine whether the subject was </≥ 60 years-old. Considering the complete absence of teeth, the odontologist considered it best to use one of the parameters of the skull/mandible as visualized on radiographs for non-invasive age prediction. Therefore, the gonial angle was measured on a lateral cephalogram for the purpose. An in-house digital method developed for measuring the gonial angle on radiographs was applied. The method comprised of opening the lateral cephalogram in Adobe® Photoshop® computer software, and drawing a line along the lower border of the mandible using the Ruler/Measure Tool in Photoshop's toolbox to rotate the radiograph and orientate the lower border of the mandible horizontally. Next, Photoshop's built-in rulers were activated along the top and left margins of the radiograph (by holding down the Ctrl+R keys in the keyboard; Command+R keys in Macintosh computers). The cursor was clicked and dragged from within the built-in ruler along the top of the radiograph, and placed along the now horizontal lower border of mandible. Next, once again, the Ruler/Measure Tool was used to draw a line along the posterior border of ramus, and the angle noted in the Option Bar of Photoshop. This is the gonial angle. The gonial angle derived in this case was 99.2°. The measurement was substituted in a population-specific formula derived from raw data shared by the principal author in Upadhyay et al. [J Forensic Dent Sci. 2012;4(1):29–33] and using logistic regression analysis (LRA). LRA is a statistical analysis which allows group prediction of an individual, in this case whether the female subject belonged to <60 year- or ≥60 year-old age group. The formula was derived from gonial angle measurements of 48 male and female subjects of age 51-70 years—19 subjects aged 51-59 years formed part of the <60 year-old group, while 29 subjects in the age range of 60-70 years formed part of the ≥60 year-old group. The logistic regression formula developed gives a probability of the subject being either <60 years or ≥60 years old. When the aforementioned gonial angle was substituted in the formula, a probability of 95.7% was obtained, indicating that there was a 95.7% probability of the subject being ≥60 years old. While the gonial angle may not be used as a routine method in adult age

estimation owing to relatively higher error rates, the case presented here represents a rare example wherein the option of applying dental age estimation methods in living individuals was not feasible and, therefore, craniofacial parameters such as the gonial angle—familiar to dentists and forensic odontologists alike—may serve as a method of choice in the absence of other alternatives.

Third molar development in a modern Danish 13-25 year old population

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ABSTRACT

Objectives: Third molar development is widely used to assess the age of adolescents with an undocumented chronological age – often to assess if the individual is over or under the age of 18. Several studies describing third molar development in different populations exist. In this study we wanted to develop a reference material based upon a modern Danish population. The collected data is intended for further analysis using Transition Analysis.

Materials and methods: Upper and lower third molars in 1302 digital panoramic images of individuals aged 13-25 (669 female/633 male) were staged following a modification to Gleiser and Hunts 10-stage scoring method. Inter- and intraobserver variations were analyzed. The stages were evaluated by looking at the transition from one stage to the next, with special emphasis on the transition from stage 9 to 10 – the final transition.

Results: Both inter- and intraobserver analysis showed good to very good agreement. In the female population none of the subjects younger than 18 had transitioned from stage 9 to 10 in the mandibular third molars. In the male 17 year old population 6/90 mandibular third molars had transitioned from stage 9 to 10 and the same for 1/108 of the mandibular third molars in 16 year old males. This suggests that in a modern Danish population third molar development can be used with higher accuracy for females in assessing whether or not an individual is over or under the age of 18.

Human dental age estimation based on third molar development: comparing an Indonesian population with multiple other country specific populations

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ABSTRACT

There are numerous methods for forensic dental age estimation as; human dentition contains multiple age related parameters. In sub-adults, third molar(s) development observed on panoramic radiographs is considered as dental age predictor [1] [2]. It is still needs to be proven in a standardized comparison that environmental factors and ethnicity are influential components in the dental bud development [3] [4]. Moreover, additional investigations must be done to check the influence of possible differences in tooth development on the age prediction results. Therefore an ongoing study was performed to detect possible ethnical differences in third molar development and the related age predictions on country specific populations [5] [6]. The ongoing study model had not integrated an Indonesian sample. As Indonesia is an isolated population scattered in small chain of islands. So, it was interesting to incorporate them in the ongoing study. The aim of the current study was to collect retrospective panoramic Indonesian radiographs on which the staging of permanent teeth [7] and third molar(s) [8] [9] development was done. The obtained degree of third molars(s) development was compared with earlier collected populations, and their influence on the age prediction outcomes was disclosed.

Retrospectively orthopantomogram of Indonesian subjects in the age range between 16-25 years were collected. All included subjects lived a whole lifetime in Indonesia and were from the same biological group. The developmental stages of the left mandibular permanent teeth were registered according to Demirjian et al [7] (excluding third molars) and all available third molars were staged according to Köhler et al [8]. The degree of third molar(s) development was denoted as developmental score (DS). Therefore a generalized linear mixed model for multivariate ordinal data was used. The Bayes estimate of the random effect was interpreted as its score on a latent factor underlying and summarizing the developmental stages of the four third molars. A linear regression model with the DS as dependent variable and age and countries as predictors were used to evaluate differences in DTMD between countries. The subject from the collected sample were divided at random but stratified on age in a training and a test dataset. The test dataset was used to evaluate the performance of the Bayesian model developed on the subjects in a training dataset. The difference between observed and predicted age was calculated and mean absolute difference (MAD) as well as

mean squared error (MSE) were used to quantify the age prediction performance.
The study hypothesis is that, as was detected with the earlier performed country specific comparisons, the magnitude of possible difference in the DS and age prediction performance turns out to be small [5-6].

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Dental age estimation in Bosnian adults. Bias, Precision and Accuracy of five methods

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ABSTRACT

The aim of the present study was to compare the accuracy, precision, and bias of five dental age estimation methods.The sample was comprised of 60 permanent teeth, obtained from 60 individuals aged 18–85 years.

Age was estimated according to the methods proposed by Ubelaker (UB), Lamendin (LA), Bang and Ramm (BR)-for intact and sectioned teeth, and Kvaal and Solheim (KS) for extracted teeth. Estimated dental age was compared to real chronological age of persons from whom teeth were extracted.

BR for intact teeth was found to be the most accurate (Mean absolute error was 2,66), with the highest precision (standard deviation 3,88) and the least bias (mean error 0,11) when estimation was performed on premolars. Except for BR method for intact teeth and BR method for sectioned teeth when estimation was performed on premolars all other methods had tendency to underestimate age in our sample. LA method displayed the lowest accuracy and precision with tendency to underestimate real age in every tooth type.

Final recommendations on which dental age estimation method should be used in Bosnian adults are based on achieved results of accuracy and precision as well as on the availability of necessary equipment and tooth type that is used for age estimation.

Third molar age estimation in young adults of Chinese ethnicity in Malaysia

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ABSTRACT

Background: Studies on crown or root growth and maturation stages of third molar involving various populations have been carried out by a number of researches. Malaysia is a country of multiple ethnic groups. Malay is the largest community, followed by Chinese, Indian and other ethnic groups. Previously in Malaysia, a few researches were carried out on age estimation using third molar teeth. However, to this date, while studies on Malay population has been done by others and Indian population is studied by other researcher ,no studies were done specifically on Chinese population, which is the second largest ethnic in Malaysia. The aim of this study is to establish a database reference of the age estimation method using third molar development in the adolescent and young adults of Chinese ethnicity in Malaysia.

Materials and methods: A sample of orthopantomograms of Chinese young adults with Malaysian citizenship were collected. The age categories were between 14 to 24 years old. Samples were taken from a number of government hospitals and clinics around peninsular Malaysia. Scoring technique developed by Gleiser and Hunts (modified by Kohler) will be applied to assess the developmental stage of third molars. Statistical analysis will be conducted to evaluate inter- and intra-observer reliabilities, to establish a regression formula for age estimation of Chinese young adult, to test the difference between chronological age and estimated age and performance of the derived formula.

Hypothesis of research: This research which is still in progress ,try to obtain the referral database for dental age estimation of Chinese sub-adult population in Malaysia . From this study, a regression formula will be generated. The performance of the derived formula will then be assessed. The outcome from this study can then be used in estimating age of Malaysian individuals of Chinese ethnicity. In addition to that, it can also be used for future research involving age estimation or comparisons for age estimation studies involving individuals of Chinese descendant from other countries or with Malaysians from different ethnicity.

Age estimation by dental developmental stages in children and adolescents in Iceland

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ABSTRACT

Introduction: For centuries teeth have been used both for identification of unknown persons and for estimating age for forensic and other scientific purposes. The dental age estimation technique is considered to be highly reliable in children and adolescents. Standard deviation in the developmental stages in this age group is from a few months to 1 to 2 years. In adults, where teeth have reached full development, regression changes are used, but the accuracy is much less than in dental development. Studies have shown that it is necessary to create a database for dental maturity for every population and compare it to others. The present study is the first one for dental development in the Icelandic population; the age range being 4-24 years. It will help in forensic dental age estimation and will also help dentists, physicians, anthropologists, archaeologists and other professionals who rely on developmental age assessment in children and adolescents.

Materioal and methods: In the present study, which is a retrospective cross-sectional study, dental maturity was determined in 1100 Icelandic children and adolescents from orthopantomograms (OPGs). The first 100 were used for a pilot study and the remaining 1000 for the main study. A total of 23 were excluded. The sample consisted of 508 girls and 469 boys from the age of 4-24 years. Dental developmental scoring system was used as a standard for determination of dental maturity stages. A total of 200 OPGs were studied both on the left and right side and the remaining on the right side. Dental maturity was established for all teeth and both genders, when the sample permitted, from the beginning of crown formation to the root apex closure.

Results: The Cronbach´s Alpha reliability test showed high reliability, R= 0.982. Girls in Iceland reach full dental maturity (stage 10, R_c) at 17.81 years of age for the maxillary and 18.47 years in the mandibular teeth. Boys reach full dental maturity at 18.00 years of age in the maxilla and 17.63 in the mandible. There was no significant difference between left and right side (r = 0.95-1.00). There was no gender difference, except in root formation in maxillary and mandibular canines where girls reached apex closure earlier than boys.

Conclusion: A reliable database has been established in Iceland for tooth development in the age range of 4-24 years, which is compatible with international studies. These results will help forensic odontologists and other professionals to estimate with high accuracy age and dental maturity in Icelandic children and adolescents.

Modification of age estimation techniques among children from Transcarpathian region

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ABSTRACT

Age estimation in forensic medical practice based on the analysis of the skeletal elements that develops and forms due to specific age features or progressive processes that are quite slow and goes on periodically in order, and so can be used as a reliable indicator for age identification criteria. During the testing of radiographic dental age estimation methods on a sample of 188 panoramic x-rays of children aged from 4 to 16 years, who were treated previously at the University Dental Clinic, it was found that the proposed approaches of Haavikko and Demirjian characterized by significant levels of absolute errors in the range of 0.79 -1.56 years. This fact indicates the need for modification of the standard calculation algorithms to minimize data variation parameters and calculate the parameters for proximization of dental age due to valid passport criteria.

Given that the rate of Pearson correlation between the intermediate data of tooth-jaw apparatus formation by Demirjian and final results determined by the method of Haavikko was argumented, we provided specific regression equation based on standardization statistic principle of all values calculated among children's orthopantomograms from Transcarpathian region. By use of this equation in the age group of 4,0-4,9 years the value of absolute error was reduced to 0,136 years, compared with 0.46 and 0.64 for Haavikko and Demirjian respectively, in the age group of 5,0-5,9 - to 0.219 years compared with 1.26 and 0.72 for Haavikko and Demirjian respectively, in the age group of 6,0-6,9 - up to 0.09 years compared with 1.03 at 0.71 for Haavikko and Demirjian respectively, in the age group of 7,0-7,9 years - for 0,021 years, compared with 0.85 and 0.75 for Haavikko and Demirjian respectively, in the age group 8,0-8,9 - to 0.168 years compared with 0.57 for Haavikko and Demirjian respectively, in the age group 9,0-9,9 - up to 0,074 years, compared with 1.13 and 0.8 for Haavikko and Demirjian respectively, in the age group 10,0-10,9 - to 0.205 years compared with 0.46 at 0.66 for Haavikko and Demirjian respectively, in the age group 11,0-11,9 - to 0.284 years compared with 0.46 per Haavikko and 0.8 per Demirjian, in the age group of 12,0-12,9 - for 0,075 years, compared with 0.7 and 0.6 for Haavikko and Demirjian respectively, in the age group 13,0-13,9 - to 0.189 years compared with 0.7 per Haavikko and 0.8 per Demirjian, in the age group 14,0-14,9 - to 0.306 years compared with 0.39 at 0.71 for Haavikko and Demirjian respectively, in the age group of

15,0-15,9 - to 0.12 years compared with 0.9 and 0.84 for Haavikko and Demirjian respectively, in the age group of 16,0-16,9 - to 0.252 years compared with 0.51 and 0.69 for Haavikko and Demirjian respectively. The complexity of mathematical calculations performed during the age evaluation of children, which includes the conversion stages of qualitative variables into subsequent quantitative data of the interim ratios argued the feasibility to develop semi-automatic form for calculating the age of the person using the computer application software. Prototype of this form have been developed for Haaviko, Demirjian, Cameriere, Willems, Kvaal, Cameriere (for adults) methods in Microsoft Excel 2016 (Microsoft Office 2016) software. The basic principle of operation of the proposed algorithm is that the operator enters into the corresponding cells of editor only the raw data, such as formation level, radiological parameters of the pulp and tooth length and width parameters depending on the protocol of the original stages for each of the technique. Then the program automatically publishes final figures of dental age range and all variances of absolute errors from the smallest to the largest.

Estimation of dental age: comparative study of different methods using teenage population of Sri Lanka from 11 to 16 years

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ABSTRACT

Knowing the physiological age of an individual is essential in a civilized society for many purposes. The best documentary evidence for age of citizens is the birth certificate issued by the relevant authority in any country. For living persons age becomes important in legal and administrative purposes, many of which are dependent on an individual attaining a certain age (e.g. a minimum age to obtain a driver's license, employment etc.). A scientific method of age estimation is required for an individual whose birth certificate is not accessible or not available due to various reasons.

Estimation of age is similarly important for an unknown deceased person, where many of the legalities associated with death (such as issuing of a death certificate, payment of insurances, crime investigations) are dependent on positive identification, including an assessment of the age of the deceased.

The estimation of age is one of the tasks performed in Medico-legal units where Forensic Odontologists have to assist in investigations regarding age of both living and the dead. When Odontology experts are requested to estimate age on the above circumstances, the methods comprising of Western and European data are being used assuming that tooth development and maturity of Sri Lankan population follow the same pattern and rate as in the West and Europe. But those data referred above may not be directly applicable to Sri Lankan population since the biological changes could vary according to ethnicity, geography, genetic pattern so on. Hence the author in conjunction with other professionals in different fields designed the present study to investigate how appropriate and accurate existing data sources are to the Sri Lankan population.

The study conducted for two years from April 2014 reviews the principles and methodology in the most commonly used six methods using dental radiographs in Sri Lanka. This has been conducted in the institute of Oral Health in Sri Lanka using panoramic radiographs of teenage population from 11 to 16 years both males and females. The sample size (35 for each age group and the total being 420) calculation was done according to the single sample mean formula and inclusion and exclusion criteria were well adopted.

The statistical analysis shows the mean and SD for each age group separately for males and females and reveals the best fit method of dental age estimation out six for the population concerned. Most importantly a simple method to estimate age using IOPA radiographs of left mandibular molars was established based on the best fit method to minimize the use of panoramic radiographs which are expensive and less accessible to clinicians and Forensic practitioners in Sri Lanka.

Age estimation based on dental pulp volume of human remains found in an early medieval necropolis in Florence

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ABSTRACT

Background: During some excavations conducted by the Archaeological Superintendence of Tuscany from 2008 to 2014, a necropolis was found in Florence, near the embankments of the Arno river, close to the Uffizi museum and the Vasarian gallery.
In a small scraps of land they have been found seventy-five skeletons.The deadbodies come from numerous mass graves, each containing aligned by the three to eleven individuals, crammed between them, even often places of cut and oriented in an alternating manner.The disorderly position of the skulls and upper limbs has been interpreted by the researchers as an indication of hasty burial due to a special emergency condition which can be ascribed to the presence of a deadly epidemic plague in the city.
Aim: The aim is the estimation of the age at death of the human skeletonized remains to reconstruct a complete picture of the conditions that favor the epidemic, and in general a picture of the life of the Florentine population at the time, through multidisciplinary research.
Material and methods: The archeological excavations under Uffizi Museum found 74 skeletons. CBCT radiographies were taken from skulls and the method proposed by Pinchi et Al (2015) was applied to calculate the volumes of the dental pulp and hard tissues. This method was previously validated on a reference sample of adults of known age. It was chosen because it is non-destructive, fast enough application, and proved to be more o similarly reliable and accurate compared with most other methods for estimating age of skeletal remains or teeth in adults applied so far in the anthropological literature.
Conclusion: The age at death of the skulls was estimated by calculating the ratio between the pulp and hard tissues of CBCT taken for the skulls. The results were compared with different estimates obtained from the analysis of different biological evidence (bone age, e.g.) . The statistical analysis is near to completion

Age estimation on pelvis x-rays

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POSTER PRESENTATION

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ABSTRACT

Introduction: Age assessment in children and young adults is a relevant forensic issue. It is requested not only in evaluating criminal responsibility in youths without proper identification documents, often in relation to age thresholds, but also for release of a residency permit, and asylum seekers of minors. The pelvis, with focus on the iliac crest ossification, has been proposed as a useful tool for forensic age estimation. In the present study the Authors verified the utility and applicability in an Italian sample of three estimation methods based on the radiographic study of the pelvis.

Materials and methods: The Authors tested the Risser method in the two FR and US variants, and a staging system inspired by Kreitner and Kellinghaus methods (KK-MS); the applicability of an area measurement method (AM) based on Cameriere's approach was also evaluated. The three methods were applied on a sample of 497 AP pelvic radiographs taken from the Orthopedic Trauma Center of Careggi (Florence, Italy), and belonging to Italian individuals aged between 10 and 25 years.

Results: Each method showed high reliability for both reproducibility and repeatability. The KK-MS staging technique proposed by Kreitner and Kellinghaus is easier than the Risser method in applicability, as it is not affected by the variations of ossification. All subjects attained stage 3c of KK-MS and 5 of Risser Fr were > 14 years, suggesting the benefits of these methods for that age threshold. The applicability of the AM method ranged between 12 and 20 years, but the statistical analysis showed only a moderate correlation with age. In order to evaluate the possible use of this method is therefore necessary to clarify and exclude external factors influencing the parameter.

Conclusions: The iliac crest ossification is of interest in age estimation for forensic purposes. The methods tested may find a useful application in addition to the other common dental and skeletal methods for the fourteen year threshold. Given the ethical limits of radiographic exposition of the pelvis, radiographic methods are applicable whenever a pelvic x-ray is available. Other studies, with a wider and more standardized sample, are needed to verify the fulfillment of forensic requirements and to develop future methods based on radiation-free technics.

Dental age estimation *in vitro* using extracted third molars, pre-surgical panoramic radiographs and CBCT scans

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ABSTRACT

Dental age estimation is an anthropological procedure performed in Forensic Odontology to reconstruct a biological profile of unknown dead bodies. Most of the methods for dental age estimation rely on bidimensional (2D) information of dental development, more specifically via panoramic radiographs. However, contemporary three-dimensional (3D) imaging, such as cone-beam computed tomography (CBCT) became available in the last decades enabling a more reliable analysis of dental morphology and development. The present study aims to validate third molar (3M) developmental stages between extracted 3M, and their registrations on panoramic radiographs (2D) and their CBCT (3D) scans respectively. The sample consisted of 226 subjects, from which pre-surgical panoramic radiographs (n=226) and CBCT scans (n=100) were obtained. The panoramic radiographs were acquired with the Orthopantomograph OC200 D® (Instrumentarium Dental®, Tuusula, Finland) device with 66KVp and 9.9mAs, and time of exposure of 14.1 seconds. The CBCT scans were acquired with the iCAT Next Generation® (Imaging Sciences international®, Hatfield, EUA) device with 120KVp and 37.7mAs, field of view (FOV) of 16x13cm, resolution of 0.25 Voxel, and time of exposure of 37.7 seconds. These subjects underwent 3M extraction (n=402: 119 upper right, 117 upper left, 84 lower left, 82 lower right) for therapeutic reasons. Retrospectively, the extracted 3M were collected from the Dental Biobank of the Federal University of Paraná. The 3M registered in radiographs and CBCT, as well the 3M *in vitro*, were staged according the technique of Gleiser & Hunt (1955) modified by Kohler (1994). Associations between the 3M staged in panoramic radiographs, CBCT and *in vitro* will be analyzed statistically for inferences on the validity of this staging technique in 3D environments. The hypothesis that 3M stages registered on 2D and 3D medical images are in correspondence with their clinically observed developmental status will be tested.

Comparison and analysis of bite marks on the cheese and bananas

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ABSTRACT

It is very important to link the offender of the crime with the evidence left on the crime scene for the successful prosecution of the case especially when there are no witnesses of the crime. Criminals after committing the offense like theft do not hesitate to plunder with the eatables at the crime scene. Frequently they will eat anything which is good and readily available. Bananas and cheese are commonly present in the homes and they eat these and frequently leave behind parts of it on which are engraved their teeth marks. These bite marks can be useful evidence for identifying the offenders.

Keeping in mind this hypothesis, an experimental study has been done on these two food items with the help of consenting volunteers; where these volunteers left bite marks on cheese and bananas. There were 50 volunteers who left bite marks on cheese and 143 volunteers left bit marks on bananas. These bite marks were photographed and life-size photographs were printed. Volunteers' dental casts were made with dental stone and then transparencies were printed using hand drawn photocopying and scanning methods. Then these transparencies were matched with life-sized photographs by overlaying technique.

In banana, there was an accuracy of 82.33% whereas in Paneer (A variety of cheese) accuracy was just28.5% where volunteers could be linked to their bite marks.

This study shows that different food materials have different rates of accuracy for linking the bite marks to the volunteers

This study gives us a data which can be applied to the crime scenes where offenders have left bite marks. Harvesting and comparing the bite marks with the casts of the suspects can help to include or exclude the suspects in the investigation and successful prosecution of the cases.

Analysis of postural distortion in human bite marks

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POSTER PRESENTATION

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ABSTRACT

Bite marks have often played an important role in many criminal investigations and sometimes present as the sole physical evidence in multiple cases. Despite the fact that bite mark evidence is accepted in courts, its fundamental validity and scientific basis is frequently challenged. Distortion of the bite mark may create complications and difficulties during the analysis and comparison of the bite marks. Postural distortion is one such phenomenon that occurs when the bite mark is recorded or viewed in a position that is different to the position of the tissue at the time of biting. The knowledge of the response of skin to movement and the areas susceptible to distortion may help Forensic Odontologist to better predict, analyse and interpret bite marks and its associated distortions. Photographic distortion is also one of the most common problem in bite mark analysis as the dentition of the biter and the corresponding bite mark is a 3-dimensional phenomenon. This presentation illustrates the effect of postural distortion on bite marks that are created on living human skin. The bite mark created are photographed with both 3D and 2D camera's.

Materials and methods: There are two phases of this research: Phase I: A 3D printed model of teeth mounted on a semi-adjustable articulator is used to create bite mark with ink on the upper arm of the subjects. Photographs of the marks with the scale are taken with a 3D and a 2D camera. Then the position of the arm is changed to three different positions: flexed, extended and rotated, and photographs are taken at these positions.

Phase II: A 3D printed model of teeth mounted on a semi-adjustable articulator is positioned in a biting apparatus. Then the arm of the subject in placed in the biting apparatus. Now the weights are loaded on to the apparatus and bite marks are produced on the upper arm of the subject. Photographs of the marks with the scale are taken with a 3D and a 2D camera. Then the position of the arm is changed to three different positions: flexed, extended and rotated, and photographs are taken at these positions.

The photographs of the bite marks taken will be analysed to measure the degree of distortion using the metric measurements in Adobe Photoshop.

Hypothesis: Most of the bite mark studies have created experimental bite marks on variety of substrates which do not display any properties of the skin, very few studies have created experimental bites on living subjects. Moreover, for better analysis of the bite mark a 3D camera is used to photograph the

marks which will help analyse the degree of distortion seen due to postural changes in more detail. Therefore, this presentation will help demonstrate as to how much degree of distortion is seen in a bite mark due to change in posture and whether this can be minimised by using a 3D camera while photographing a bite as compared to a 2D camera.

Reliability and validity of bite marks analysis: a systematic review

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POSTER PRESENTATION

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ABSTRACT

Introduction: An abusive bite is a physical oval / circular injury caused by the dentition of a human or an animal to a human. However, bite marks are unique among physical injuries since they can potentially identify (or exclude) a specific perpetrator. The base of bite mark analysis is the uniqueness of anterior teeth characteristics which can be transferred in the bite injury.

Objective: The aim of this study is to perform a systematic review concerning the reliability and validity of bite marks, including articles that had been published during the last decade.

Material and Methods: The systematic review included all the articles concerning bite mark that have been published from 2006 until today. The article search was performed in 4 electronic databases (PubMed, ScienceDirect, LILACS, and Cochrane Library). Initially MeSH terms were used as keywords. Moreover, the search sensitivity was improved by the use of free text terms as keywords. Specifically, forensic dentistry, human bites, bitemar*, tooth mar*, bite mar*, forensic, bitemar* analysis and bite mar* analysis, applied in 6 different combinations on each search engine. Articles were independently reviewed by three reviewers. A fourth reviewer resolved disagreement between the initial reviewers concerning the evidence type of the article or whether the study met the inclusion criteria. Inclusion criteria of the articles were English language, abusive bite marks, human bite marks. Exclusion criteria included language other than English, review articles, case reports, methodologically a inconsistent papers. Initially a total of 708 articles were found. After removing the duplicates 462 articles remained. Additionally, 18 articles in languages other than English were excluded and 305 considered being irrelevant by title. Subsequently, three reviewers evaluated the 139 remaining articles that would be finally included in the review.

Results: Bite mark analysis considered a very complicated and controversial topic among experts in Forensic Dentistry. Several parameters such as location, time since injury, interference of clothing may affect the analysis and interpretation of bite injuries. Subjectivity and experience of the involved forensic dentist mainly affect the reliability of bite mark analysis

Bite mark analysis on different skin tones

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ABSTRACT

A bitemark has been defined as 'a pattern produced by human or animal dentitions and associated structures in any substance capable of being marked by these means'. Forensic odontology has gained wide acceptance in the field of criminal justice because no two people have identical teeth. Presence of physical evidence such as bite-marks in cases of rape, murder and violence are considered very valuable. These are considered to be an expression of dominance, rage and animalistic behaviour. These marks are also valuable in determining the type of physical abuse and age bracket of the criminal. With increase in criminal cases the use of bite-marks as Forensic odontological evidence in nailing the culprits truly points out the important role odontology plays in field of criminal justice. The aim of this study is to determine how to identify bitemarks on different skin tones and the color changes occurring during healing of bitemarks. The materials and methods used for this study are Dental cast that is mounted on a bite articulator, Measuring scale, a shade card for different skin tones also a chart for the color changes in a bruise to compare the healing. Bite marks are produced in arms and legs with the dental cast that is mounted on the bite articulator and then photographs are taken of these marks with a scale. The bitemarks are then observed over a period of time according to its color changes on different skin tones. After that photographs are taken and compared. The amount of force used by the articulator on arms and legs may be constant. As there are several factors that can affect an identification of the bitemark like the distortion of bitemark, skin related factors such as - underlying musculature, fat, curvature and looseness or adherence to underlying tissue, highly viscoelastic nature that allows stretching, distorting under pressure and recoiling back to their original position. Also Langer's Line that represent directional differences in the degree of extensibility of skin. They affect the dimension of the bitemark base on the position of the bite. The pattern of the bitemark could be also affected by Ecchymosis, Linear abrasions, contusions, or striations, Double bite, Weave patterns of interposed clothing, Peripheral ecchymosis .Pain scale is another factor that is considered in this study .The amount of pain that every individual can bare is different . hence to record a bitemark the force used cannot be constant for each individual.

Forensic odontologist should consider skin tone when analysing a bitemark because there a great range of skin tones which will show different colour changes. Most of the research is seen on white skin but the study on other skin tones is scarce. This study will help in distinguishing the bitemark patterns on the skin tones other than white

Analysis of ^{14}C and ^{13}C in teeth to assist in identification work

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POSTER PRESENTATION

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ABSTRACT

The characterization of unidentified bodies or suspected human remains is a frequent and important task for forensic investigators. However, any identification method requires clues to the person's identity to allow for comparisons with missing persons. If such clues are lacking, information about the year of birth, sex and geographic origin of the victim, is particularly helpful to limit the search for possible matches. We here present results of stable isotope analysis of ^{13}C, giving a clue to geographical origin, and bomb-pulse ^{14}C analyses for birth dating. The ^{14}C analysis of enamel can provide information of the year of birth with an average absolute error of 1.1 ± 1.3 years (1).

A human skeleton covered by 40 cm of soil at a construction site in Sweden during excavation work early 2015. Forensic examination revealed that the person had been killed by blunt force to the head. The responsible pathologist estimated the deceased to have been dead for less than 1 year, but could only provide a vague estimate regarding the age of the subject and reported that the person could be 25-45 years, which allowed for numerous alternatives.

Two teeth were extracted and enamel and roots were subjected to both ^{14}C, and ^{13}C analysis.

The average concentration of ^{14}C in both teeth enamel suggested enamel laydown at 1973.0. Using reference information about ^{14}C incorporation times in tooth enamel (2), the birth of the individual was calculated to be 1968.7.

^{13}C values were generally low, fitting individuals grown up in Scandinavia. At first, the police checked the missing person register and found 11 possible alternatives, however none of these matched DNA of putative relatives. Based on the isotope results, the police redirected their search and found a possible match, which was confirmed by DNA profile. This individual was indeed a male, and born 1967.8.

During the fall of 2014 a dead body was found in the water close to the Swedish east coast. The body was severely decomposed, but the characteristics of the body suggested a female. Three teeth were prepared for separate analysis of crown and root. The average birth of date of the person was estimated to 1976.6. The ^{13}C analysis of both crowns and roots showed somewhat higher values than those typical of the Scandinavian population.

Based on this information, the police eventually found a possible match, that was confirmed by DNA analysis of samples from muscles and bones of the body and blood

samples from relatives. The person was identified as a woman born 1975,4 from continental Europe. These cases illustrate the usefulness of isotope analysis in forensic casework.

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Teaching forensic odontology in the 21st century

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POSTER PRESENTATION

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ABSTRACT

In 1897, Dr. Oscar Amoedo published a short article describing the identification procedures used in fire of the *Bazar de la Charité*, followed by a thesis entitled "*L'Art Dentaire en Medicine Legale*,". Those academic achievements honored this Cuban born dentist the title of "Father of Forensic Odontology". Over the centuries, Forensic Odontology continue to develop because of the further improvement in technology and crescent recognition of its relevance to legal issues. Academically, there is a current increase in the number of people interested in the subject and the number of courses is rising. The aim of this research is to investigate the challenges encountered by people that actively teach Forensic Odontology. A questionnaire will be sent to 20+ professionals worldwide. The research hypotheses are: a) there is a urgent need to strengthen the link between academia and practitioners; b) professionals might consider a very challenging subject to teach; c) people interested in the subject should be aware that this branch of Odontology entails a great deal of work for the acquisition of knowledge and d) it is necessary to discuss the quality assurance of undergraduate and postgraduate courses.

Healthcare quality - clinical monitoring procedure of a study case

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ABSTRACT

The quality of Healthcare is analysed and evaluated by different indicators, in which we highlight the existence of protocols for clinical procedures.

Clinical case description: The present case refers to an orthodontic rehabilitation in a young man, from the age of 13 to 17 years old. The treatment plan comprised dental extractions and placement of fixed orthodontic braces in the upper and lower arches. The medical-legal evaluation of the sequelae of this rehabilitation assumes future damage after a rigorous objective examination and analysis of complementary examinations (CBCT). This damage is considered due to the presence of severe root resorption in all dental elements of the upper arch, which was not monitored during the procedure.

The existence of a protocol cannot be a sine qua non condition to achieve healthcare quality. It should be required, in addition, its execution according to *leges artis*.

The presentation of this case reveals the importance of monitoring the clinical procedure, as an indicator of the quality of the clinical result obtained

POSTER PRESENTATION

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Dentistry in Court – the importance of the dental expert witness: malpractice litigance case report series

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POSTER PRESENTATION

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ABSTRACT

Background: in Brazil, Forensic Odontology is a recognized dental speciality and the Forensic Odontologist is the professional with a mandatory degree in Dentistry and the expertise field is regulated by Federal Law 5081/1966 and by the Brazilian Federal Council of Dentistry, guaranteeing the right to work in the criminal, civil, labour and administrative/ethics areas. Hence, in cases involving dental malpractice litigance, the Judge will nominate a dentist to act as Expert Witness, and due to the judicialization of health, many cases in different dental fields reach Courts in recent years.

Objective: present, through a case report series, the dental specialties involved and the important of the Dental Expert Witness.

Methods: The cases were selected from the exams performed in the Forensic Odontology Expert Witness Service (USP, Faculty of Dentistry, Ribeirão Preto, Brazil) in the last three years. Results: the cases studied involve Dental Surgery, Orthodontics, Dental Implants, Endodontics and Prosthodontics, and all of them had an expert report requested by the Court, which showed information as the causal link, damage and technical aspects involved.

Conclusion: It can be concluded that the Court decision related to malpractice litigance cases in Dentistry is grounded in the report presented by the Dental Expert Witness and it is extremely important that Forensic Odontologists hold this position in the Courts.

40 Years of history of forensic dentistry in Argentina

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POSTER PRESENTATION

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ABSTRACT

Since its creation in 1977, SADOL (Argentine Society of Legal Dentistry) has celebrated its 40th anniversary as a society that brings together dental professionals from Argentina who are engaged in Forensic Dental practice both in forensic practice and in university teaching The matter.

Being the event where I work forensic dentistry to Argentina worldwide was in the accident that occurred on June 24, 1935, in Medellín, Colombia, where El Crian Zorzal died, Carlos Gardel. We will describe the contribution of forensic dentistry in case of international repercussions, such as the identification of "Che" Guevara (1997), helicopter crash with French athletes in La Rioja (2015), among the most outstanding.

The teaching of specialization in legal and forensic dentistry, in 1995 the first cohort of specialists in legal dentistry at the Faculty of Dentistry of the National University of Tucuman, approved by the National Commission of Evaluation and University Accreditation (CONEAU).

Due to the growth and interest of Latin American colleagues in exchanging experiences and knowledge, A.O.F.S. (Association of South American Forensic Dentists).

Incipient steps of forensic odontology in Sudan

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POSTER PRESENTATION

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ABSTRACT

Forensic dentistry played a major role in serving justice and community. As it was ages since Oscar Amoedo wrote his treatise on forensic odontology, this science was not recognized in Sudan untill the last ten years. Although there were unpublished data about two cases of identification in Sudan by using teeth in the years 1986 and 1988. Changes in the Sudanese law in terms of adding Child Act in 2010 Drew the judicial authorities' attention to The importance of setting a criminal age which became 18 years old. Age estimation had risen as a problem due to the lack of birth certificates database in all the States of Sudan. Criminal age estimation committee has been established since 2011 under the umbrella of the Ministry of Health. The first Sudanese forensic dentist was registered in the Sudan Medical Council in 2014. Few universities started after that to adopt forensic odontology in their undergraduate curriculum. In the last decade, many published and unpublished studies, reports and workshops had been conducted in Sudan to adopt the scientific evidence by which we can establish our guidelines, rules and regulations in forensic dentistry. In this paper we will review all these steps and guidelines in addition to pass through all the research work, studies and cases in the field of forensic dentistry that had been done in Sudan in the last ten years.

3D print technology use in bite mark analysis

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POSTER PRESENTATION

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ABSTRACT

The forensic dentistry has become increasingly present in the forensic institutes in Brazil. Within its field of operation, stands human identification in mass disasters, charred bodies and bitemark analysis. 3D technology has been used in little cases. The aim of this study was to analyze 3D print technology in a simulated case. 20 models were digitalized and printed with a 3D print (Sethi 3D). 10 objects were randomly bitten by 10 suspects. After biometrical analysis, it was possible to relate each object to each author. These results show that it is possible to positively analyze the authorship of bites and objects through 3D printing technology.

Proposal for addition of forensic odontologist in team of forensic facial reconstruction – from evidence to decision

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POSTER PRESENTATION

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ABSTRACT

Introduction: Forensic facial approximation (FFA) 3-dimensionally recreats face of an individual from skull remains which adequately resembles deceased person to allow his / her identification. FFA involves an assimilation of anatomy, forensic science, anthropology, osteology and above all craftsmanship to artistically recreate the identity of the deceased.

Aim: To highlight skills and attribute of dentist / forensic odontologists qualifying him to be part of FFA team.

Methodology: Through this poster, we discuss to propose inclusion of a dental expert (preferably a forensic odontologist) to be a part of FFA team based on their sound scientific knowledge about human anatomy, musculature as well as exposure to various hard tissue and soft tissue landmarks that are taught as a part of BDS curriculum all over the globe.

Conclusion: Practical training given to dentists / forensic odontologist including artistic handiwork with adept use of various hand instruments may attest extremely beneficial when working on the skull, hence qualifies him/her as an expert to included in team of FFA.

Forensic cranio facial reconstruction using Cone Beam Computed Tomography current concepts and future research

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POSTER PRESENTATION

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ABSTRACT

After attending this presentation, attendees will be aware of the fact that there is indispensible need of adding Cranio Facial Reconstruction (CFR) data base using Cone Beam Computed Tomography (CBCT) of various populations for forensic facial reconstruction (FFR) purposes.

The aim of this review paper is to give an exhaustive and critical review on the advantages of using CBCT over other 3D reconstruction techniques. Conferring facial soft tissue thickness (FSTT) population studies data base of varied population till date defined within a common framework of facial identification. Further the paper will also discuss the deficiencies in research data base of FFR with CBCT in various populations and focusing to create awareness of future requirements.

Extensive online searches were conducted and with all kinds of evidence exists an overview is provided. The main purpose of craniofacial approximation is to recreate a likeness of facial appearance from an unidentified skull using the relationship between facial soft tissue thickness (FSTT) and the skull.[1,2]

CFR techniques can be classified into three categories: the anatomical Russian method, the anthropometrical American method and the combination Manchester method.[3] For approximate facial reconstruction of the human face it is necessary to know the average facial soft tissue thickness of specific sites on the face. This requires establishing a database of soft tissue thickness related to age, sex, race, ethnicity,[4] skull shape,[5] nutritional status[6] and body mass index.[7]

Many imagining techniques like, magnetic resonance imaging (MRI),[8] computed tomography (CT)[9] ultra sound (US)[2] and cephalometric radiographs[10] have been used till date to study the FSTT.

It's been shown recently that CBCT images of the face are a much reliable method of measuring the soft tissue thickness in the facial region and give a good representation of the FSTT.[4] It has a number of advantages over other methods like increased speed of data collection, less invasiveness and the ability to obtain a 3D archive of the subject's facial morphology. CBCT visualises high-contrast in sufficient quality with a remarkable low level of metal artefacts.[11]

A review of literature reveals that studies have been conducted on various populations using different imaging techniques to compile the data set.[12-31] In disparity, very few researches have been conducted in Netherlands,[32] Dundee[33] and Korea.[34, 35] for CFR with CBCT and these studies comprise small sample size,

varying in their method of extraction, number and position of landmarks, condition of the body and sub-categorization of the data.
The goal is to retrieve the facial recognition setup automatically using facial measures of similarity, to have identification success that can be obtained more accurately with CBCT[1]. The tool should be free to the community for making stronger data base impending use in practice.
Finally, we conclude this review by suggesting future directions of need to collect as much CFR data as possible using CBCT with set norms among different populations and subsequently performing validation to increase the practical relevance of CFR methods in crime-scene investigations.

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The problem of forensic odontology for victim identification of mass disaster In Yogyakarta, Indonesia

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POSTER PRESENTATION

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ABSTRACT

Background: Indonesia is a country which has high risk of disaster, due to its geographical area. Volcano eruption, earth quakes, flood, fire, mass transportation accidents, etc are frequently happened in our country. We established National DVI team to manage the victim identification in mass disaster. Forensic odontology is one of the primary method which is fast, accurate, and low cost, however, at present, it is not easily implemented in our country, especially, Yogyakarta.

Aim: To report the implementation of forensic odontology in mass disaster of Yogyakarta, Indonesia.

Methods: Analyze the use of forensic odontology from the data of victim's identification result of three mass disaster happened in Yogyakarta, which are : Yogyakarta earthquake (2004), Garuda Indonesian Airplane accidents (2006) , and Merapi volcano eruption (2010).

Results: Forensic odontology identified the victim in : 2006 Yogyakarta earthquake 0%; in 2006 Garuda Indonesian Airplane accidents 95 % ; and 2010 Merapi volcano eruption 0%

Conclusion: Due to lack of antemortem data, forensic odontology is difficult to be implemented as an identification method of mass disaster in Yogyakarta, Indonesia.

Evaluation of the reliability of age estimation using Cone Beam Computer Tomography (CBCT)

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POSTER PRESENTATION

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ABSTRACT

Introduction: Age estimation of both the living and the dead is one of the most important sub disciplines of forensic sciences and is of supreme importance in medicolegal issues. It can be used as a presenting evidence in court for individuals of unknown birth records for matters of medical jurisprudence and social norms. The identification and age estimation of the dead when information regarding the deceased is unavailable is important from both legal and humanitarian aspect. It is also important in the setting of a mass disaster or crime investigation.

Aim: To estimate the age of individuals using three methods: Third molar calcification, height of the mandibular condyle and the length of the mandibular body; to compare the estimated age with the chronological age of the individual and to identify the most reliable method for age estimation.

Materials and method: The CBCT scans of 100 patients were included in the study. The scans were divided into two gender specific groups and further sub-divided into two smaller groups of 12-18 years and above 18 years. The chronological age of the subject was recorded based on his/ her date of birth. The third molars from all the four quadrants were assessed and categorized into their respective developmental stages given by the modified Demirijian's chart. The length of the mandibular body was obtained by measuring the length between the points Gonion (Go) and the Gnathion (Gn). The height of the condyle was obtained by measuring the distance between the maximum condylar height and the minimum height at the sigmoid notch. The values obtained were subjected to statistical analysis. Age estimation formula for each parameter was derived by simple linear regression analysis.

Results: The standard error in age estimation with third molar calcification, length of mandibular body and height of condyle was 6.146, 7.511 and 7.504 respectively. Among the three variables used third molar calcification showed least standard error (i.e. 6.146).

Conclusion: With the number of samples analysed and the results obtained, it can be concluded that the third molar calcification could be a comparatively reliable method for age estimation among the three parameters used in the study.

Morphological variability of the human mandible canal: a Cone-Beam Computed Tomography evaluation

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POSTER PRESENTATION

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ABSTRACT

Objective: To evaluate regional variability in neurovascular structures of human mandibles from different geographical origins.

Materials & methods: The anatomical variability of neurovascular canals and their relation to the tooth roots of 96 human mandibles deriving from
different geographic regions. They were collected and analysed using CBCT.

Results: Geographical analyses indicated that the neurovascular mandibular canals and the distance to tooth roots vary significantly amongst geographical
areas. Discriminant analysis showed that Greenlandian mandibles could be differentiated from other geographically distributed human mandibles, while
Brazilian and Belgian mandibles showed no distribution overlapping with Indian and Congolese mandibles.

Conclusions: Specific neurovascular canal features may characterize specific geographic populations, which would assist in determining geographical
origin of unidentified human beings, and in preventing the potential surgical and pathological risks.

Damage valuation research and teaching in Brazilian Forensic Dentistry using realistic simulation with moulage

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ABSTRACT

The creation of simulated lesions using moulage can help Forensic Dentistry in research field through the realistic simulation of injuries, considering, for example, the need to compare the trauma victim with his previous condition. It also contributes the teaching of the posttraumatic dental damages valuation, avoiding that this topic be taught in a theoretical and illustrative way through the use of projected images, distancing the student from the practical experience of this discipline. The objective of this article was to report the damage valuation research line scientific production at the Faculty of Dentistry of the University of São Paulo (São Paulo, Brazil), and teaching experience highlighting the potential use of realistic simulation with moulage. Besides the methodology applied to undergraduate students, reaching about 130 students per year, it has already been used in two PhD thesis and is being applied in a Post PhD research. The search for the best scientific evidence has always been a challenge to researchers. In the field of posttraumatic injuries quantification, this proportion is even greater when it is necessary to adapt them to the specific areas of law, medicine, ethics in research and dentistry worldwide. This is an innovative methodology, showing a promising perspective in the field of forensic research on the subject, in addition to its high potential use in the teaching of this course in Forensic Dentistry, as well as multicenter studies.

Comparison between 2D and 3D facial images for forensic identification

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POSTER PRESENTATION

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ABSTRACT

The three dimensional (3D) face scanning technology provides a realistic representation of the patient's face. Especially since it is non-invasive and non-ionizing, it is useful to further analyze maxillofacial deformities. Moreover, the 3D facial scanning technology have brought new opportunities for forensic identification. Indeed in forensic practice, the reliability of identification is dependent on the quality of the reference images and the frequencies.

The aim of this study is to comparatively assess and validate the accuracy of 3D and 2D facial imaging.

2D and 3D images of 50 subjects were collected. 2D photography were taken in the clinical setup with Nikon camera. 3D images were captured with two systems: ProMax 3D max (Planmeca) and 3D Vectra H1 (Canfield Scientific). The acquired 2D and 3D images were afterwards transferred to a computer for objective (quantitative) and subjective (qualitative) analysis.

After training and calibration, two observers should perform quantitative analysis identifying soft-tissue facial landmarks, including linear proportions and angular measurements. For qualitative analysis, a group of 10 observers should complete a questionnaire regarding facial characteristics on 2D and 3D images.

What we expect is to find a similar performance in 2D and 3D imaging regarding quantitative measures, but an improved qualitative scoring for 3D imaging. Besides, when comparing both 3D systems, the clinical Vectra 3D seems yielding superior results.

Forensic facial reconstruction: manual versus digital techniques in a simulated case report

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POSTER PRESENTATION

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ABSTRACT

Identification methods require a suspect to confront ante mortem data and when there is no evidence to find a suspect, Forensic Facial Reconstruction (FFR) can be very useful. The FFR is performed based on the pre-determined anthropological profile and following mean values of soft tissue thickness found in the literature The FFR can be done by manual technique, in an artistic way, by modeling the face with clay or other similar material, or digital, with the aid of computer graphics. The final result is not the total precision of the face, but an approximation that can lead to the recognition of the victim by some familiar or friend, so that, if there is a suspect, conventional analyses for the establishment or not of identity can be followed up. The objective was to perform both techniques in a same didactic artificial skull, determined as male, between the ages of 30 and 40 years, predominantly caucasian, and compare the results obtained, as well as the difficulties and differences found between the two techniques. The FFR manual protocol was based on Wilkinson and Ryan (2012), while the digital protocol was followed on Moraes and Miamoto (2015). In both protocols, the soft tissue thickness table proposed by Beaini (2013) was followed. The influence of the operator was verified throughout the manual technique process. Nose, mouth, ear and eyes required greater manual dexterity of the operator in this technique. The greatest difficulty in the execution of the digital technique was in relation to the eyes, since whenever the final texturing was attempted, they disappeared or changed color. The texturing of the skin also represented an obstacle, since the software did not respond to the commands as the literature indicated. The time to perform the manual FFR was two days while in digital it was spent ten days. It was concluded that it is possible to perform FFR by the two methods by inexperienced people, being the manual technique more subjective and digital with greater complexity and difficulty in the execution and the final faces presented physical similarity.

Human identification using frontal sinus comparison in computed tomography: case report

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POSTER PRESENTATION

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ABSTRACT

The frontal sinus is a relevant structure when approaching human identification, mainly due to its unique characteristics from a person to another. This anatomical feature might appear in some imaging exams, such as computed tomography (CT), whose forensic application it is already widely discussed in literature. However, physiological and pathological changes should be considered, as well as post-mortem changes in its morphology. In the present case report, it was observed that CT exams allows precise and trustworthy results, together with great reproducibility in this structure's area assessment. Shape and asymmetry of the sinus were some of the qualitative parameters analysed. The number of lobes were equal in the ante-mortem and post-mortem images. In conclusion, anatomical and imaginological knowledge have extreme importance in the forensic routine, in addition to identification processes apprehension. In this specific case, it was possible to establish positive identification of the questionable corpse through analysis of tomography axial plane images, obtained from the frontal sinus region, on ante-mortem and post-mortem instances.

Positive dental identification in charred human remains: case report

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POSTER PRESENTATION

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ABSTRACT

Human identification procedures require many conducts that involves a multidisciplinary team with professionals of Dentistry, Medicine, Biology and others. The Dentistry importance is associate with the study of teeth, mainly when the body presents an advanced stage of decomposition, so the fingerprints (that, in Brazil, is civil register for everyone) cannot be obtained. This condition prevents traditional identification and the teeth have the capacity of conservation, contributing considerably to the solution of several cases. The aim was to present a case report about the aspects associated with the identification of charred human remains by dental records. The body was registered as unknown, so medical and dental exams were performed to establish its identity. It was used methods for ante mortem and post mortem comparison by dental records like plaster models, x-rays and palatal rugoae and had a positive identification. In this case, the body was completely carbonized and the identification was possible only by dental records. It was concluded that well-done and preserved ante mortem dental records are fundamental for data comparison, ensuring basement to claim the positive identification or the exclusion.

Forensic Odontologist and the importance in human identification: general situation in the official organs of expertise, Brazil

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POSTER PRESENTATION

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ABSTRACT

In Brazil, the Forensic Odontologist is a professional with a degree in Dentistry which has your work regulated by Federal Law 5081/1966 and by the Federal Council of Dentistry, guaranteeing the right to work in the criminal, civil, labor and administrative areas. Regarding the criminal scope, it is usually included in the official institutes of expertise, exemplified by the Institute of Legal Medicine (IML), Institute of Criminology (IC) or General Institute of Expertise (IGP), where they are extremely important for being the only true experts in the area and being able to develop human identification, anthropological exams, analysis of injury and stains, age determination, determination of alcoholic intoxication and other tests. In this context, the objective of this study was to perform a survey and analysis of the scenario of the Forensic Odontologist in the Brazilian states, in order to define the presence of these professionals in the human identification cases, as well as the states that have this professional career established. For this purpose, descriptive research was used with the electronic sites of the Civil Police, Technical-Scientific Police or General Institute of Expertise of each federative unit. After analyzing the survey data, it was concluded that in spite of the present regulations in 17 states, only 12 have the participation of the Forensic Odontologist in identification cases, being in the other states performed by dentists as criminal expert or other professionals.

Human identification in forensic dentistry: learning strategies for dental students

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POSTER PRESENTATION

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ABSTRACT

Forensic Odontology is a subject in the majority Dental Schools in Brazil and, routinely seen as bureaucratic and time-consuming issue. It is because they are supposedly theoretical and distant subjects of the traditional clinical activity. One of the themes is human identification and it is a challenge for the professor to link the theoretical knowledge of this issue with a practical situation to the students. At USP - School of Dentistry of Ribeirão Preto, Brazil, the practical activities of human identification with the students is organized in a group activity where the students, in front of several simulations of real situations, must make decisions and prepare reports on each activity. The objective of this study was to present a brief description of the practical activities capable of being structured in the context of the human identification in Forensic Dentistry. The practical activities for human identification are: I) Forensic Archaeology: students perform field digging using forensic archaeology techniques and document the process through photos and sketches of the local examined. A synthetic skull and mandible are buried and must be removed from the site. Their dental arches should be analysed to get the post mortem data. In a second moment, four different dental records are distributed to the students that differ in format and content, where one of them is compatible with the one found in the site. II) Simulated dental mannequins: The artificial teeth of the dental mannequins were submitted to several procedures involving extractions, fillings, prostheses, among others. The first stage of the activity consists of a detailed examination of the mannequins to obtain the post mortem information of the victim. Subsequently, it is done the comparison of the information obtained and the ante mortem information contained in four dental records in order to obtain a possible identification. III) Simulated local crime: the activity is developed through the creation of a fictitious story, with a criminal outcome. The purpose of this activity is to simulate a crime scene for the students, where they need to find all evidences for the subsequent report elaboration. Through the implementation of these activities it was verified that the use of several materials and methods to perform practical activities on human identification in the graduation is viable and applicable and these methods facilitate students' learning and memorization through real practical experience.

Odonto-Maxillo-Cranial identifications and wanted/ missing persons: International police horizons

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POSTER PRESENTATION

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ABSTRACT

Facial and skull identifications can have many forms. If some of the procedures are quite a lot different between a unit forensic work and a terrorist crime scene like Bataclan, Bombay or Brussels, the ways used by forensic teams cannot be ignored ; radiological imaging is a full part of that.

Interpol *notices* are born from a police ideology : helping all the polices supported by Interpol.

The exposition is focusing towards International Criminal Police Organization (I.C.P.O.) *notices*.

Eight *notices* are currently used ; each one has a particular allocation and it's exclusive color.

Some of the notices are directly connected with the idea of identification : red, yellow, black, orange, and UN/Interpol too.

-Red *Notice*. : wanted persons (to extradition or similar lawful action)

-Yellow *Notice*. : missing persons (minors, persons unable to identify themselves)

-Black *Notice*. : unidentified bodies

-Orange *Notice*. : imminent threat against public security (person, process, object, event)

-Security council U.N./Interpol *Notice*. : war criminals

There are currently four identification ways used in Interpol notices :

-physical description,

-finger prints,

-photographs,

-DNA.

Each procedure has it's plus and minus ; from time to time a notice has problems with a strange description, fingerprints are incomplete, photographs are unexploitable and DNA damaged. With charred persons, difficulties are increasing and none of the four criteria is the good one.

DVI experience indicates that getting *ante mortem* X-rays is a good deal for identifying bodies.

So we need an additional solution which must be :

-really usable in the 190 countries connected to Interpol

-useful

-repeatable

-very hard to falsify

-small price (no more than DNA)

A *radiographic file* made of three standard X-rays can meet these requirements in every field.

In case of deep facial orthognatic surgery as we can find now

with mafiosi or terrorists, special cephalometric lines and particular superimpositions will help to identify these persons.
The complete file is composed of :

- a lateral long range full skull X-ray
- a frontal long range full skull X-ray
- an orthopantomogram

We do have now a radiological anthropometric criterion, the *fith criterion*.

Selfie Identification App as a forensic tool for missing and unidentified persons

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POSTER PRESENTATION

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ABSTRACT

Social media and Smartphone applications can be a valuable investigative tool in the search for missing and unidentified persons. There are several applications for smart phones which assist in the search for missing persons. Crime investigations already benefit from the vast amount of information available online, such as videos and photos. There is not yet a forensic application with the aim of assisting the human identification process, through the search of ante mortem data to be used as adjunct data in the comparison with post mortem data collected during a dental autopsy.

The aim of this presentation is to introduce a new application for Smartphones which will employ selfie and face photographs as an archive of dental data and dental features of the frontal teeth of missing persons. "Selfie Forensic ID" app will be available to public for free download, thus creating a way to search for extra ante mortem identifying features of the lower third of the face and front teeth when the search of compatible profiles of missing persons has already been narrowed by investigators and forensic technicians. Features such as diastema, rotated or wrongly positioned teeth, lip anomalies, recognisable fixed prosthetics, dental crown discolorations, dental or cutis piercing could represent strong identifiers in the comparison of AM and PM data, through visual recognition including forensic dental identification.

In the authors' opinion, the increased number of terrorist attacks and natural disasters which result in the premature death of innocent people, underlines the importance of storing personal identification data in order to avoid bodies remaining unidentified. The authors believe there will be an increased public willingness to share personal ID information, including Selfie photographs and DNA samples, through understanding of the ethical and administrative consequences to the families of deceased persons should bodies remain unidentified.

Forensic Odontologist and the importance in human identification: general situation in the official organs of expertise in Paraguay

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POSTER PRESENTATION

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ABSTRACT

The application of dental techniques and methods for identification purposes is an unequaled method in cases where the magnitude of the corporal damage prevents the identification by other methods. It is supported by experts that there are no two identical dental arches and even the teeth of monozygotic twins show variations, and further the resistance of teeth to destruction by fire is known and this demonstrates the high value of Forensic Dentistry and dental records for the identification of burned or charred individuals. The objective was, through a report of two different cases, to demonstrate the importance of dental records to allow human identification, as well as dental expert examination. It is an plane crash where there were five victims and all bodies were completely charred. The state of the bodies made it difficult to identify by conventional means used in Paraguay (visual recognition and fingerprints), which led to the application of dental techniques for identification purposes. With these cases report we were able to observe the importance of dental records and dental expert examination in the process of human identification

Identifying a person through dental calculus

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POSTER PRESENTATION

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ABSTRACT

Background: Dental calculus is a microbial film consisting of dietary components, oral microorganisms and host secretions. It acquires human DNA from saliva and gingival crevicular fluid. The reasons for selecting dental calculus as a DNA reservoir are: abundant quantity in oral cavity, rich DNA content, densely mineralised and ability to withstand environmental contamination.

Aim: To establish the identity of person from DNA present in the dental calculus.

Material & Methods: In this pilot study, twenty subjects were selected on the basis on pre-determined inclusion and exclusion criteria. After taking institutional ethical clearance and informed written consent, samples of dental calculus were collected from the thickest portions of calculus deposited on the lingual surface of mandibular incisors. Nuclear DNA was extracted from samples of dental calculus and amplified using Polymerase Chain reaction. Gel electrophoresis was done to find out how many repeats of Short Tandem Repeat sequences exist which were then used to create genetic fingerprint of an individual.

Results: This study included twelve males and eight females with mean age of thirty years. Results of DNA quantification varied from 22µg/ml to 37.8µg/ml. Genetic fingerprint were created for all the participants.

Conclusion: Genetic fingerprinting created from DNA found in dental calculus can serve as a unique personal identification tool in forensic investigations.

Contribution of Odontologist´s specialized knowledge on human identification process at Brazilian forensic institutions

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POSTER PRESENTATION

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ABSTRACT

Forensic Odontology integrates the forensic sciences. It works in the interest of justice and it involves the right handling, evaluation and presentation of dental evidence. The dentist's scope at Brazilian expertise official Institutes must be restricted to only analysing dental data, but it can be extended to other areas if circumstances so require.

The aim of this study, based on a wide bibliography, was to present the role of forensic dentist as a member of the official framework of expert performance, highlighting his contributions, peculiarities and importance. Their most known duty is related to the human identification process since dental characteristics are unique and the teeth represent the more resistant tissue of the human body. So, it includes not only the comparison of the odontological features but also adequately extraction of genetic material for DNA analysis when there is no other way to achieve an identification. When the unknown individual presents no teeth, the palatal rugae pattern may be useful. If there is no trace of the deceased's identity, the dentist can establish a dental anthropological profile, based on skull's bones and teeth, by means of determining sex and estimating age, stature and ancestry. Bite marks are likely to be noted on the skin of both the victim and the aggressor in cases of sexual assaults and child abuse, and frequently they are disregarded by a non-dentist. Besides that, bite marks and lip prints may be observed in crime scenes. Those marks can lead to a suspect or even exclude one, either by the physical aspects or by the biological material that can be extract from them. Furthermore, an Odontologist is probably the more indicated professional to manage some facial recognition technology.

It was possible to observe the outstanding pertinence of Odontology on criminal sphere besides the unanimous agreement on its vital part in the official forensic Institutes. A multidisciplinary approach with dentist as a part of expert team means great influence to determine the success of an investigation, which is reliant on the Odontologist's specialized knowledge to interpret the evidences properly. Even though, this situation is not common in many Brazilian forensic institutions and it probably implies lack of proper technical and scientific analysis and underevaluation of available evidences. Despite numerous published papers on this theme, new researches challenges include improvement in the accuracy of parameters in order to minimize some limitations.

A study of lip print patterns among students of different ethnic groups at the university of Dundee, Scotland

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POSTER PRESENTATION

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ABSTRACT

Introduction: Lip prints are unique to an individual and can be used in criminal investigations and forensic identification. Although separate studies have previously been carried out in different population groups, there are no studies dealing with the different ethnicities by using standard methods of collection and analysis. **Aims:** The aims were: First, to compare the results when using quadrants against sextants to locate any differences and determine which method is more appropriate, secondly, to find a possible link between ethnic group and predominant lip print pattern, and thirdly, to assess the reproducibility of lip print classification. **Materials & Methods:** 85 students ranging from 17 to 35 years of age were included in this study. They were classified into 5 ethnic groups, namely, White, Black, Asian, Arab and Mixed. Their lip prints were taken using dark lipstick and transparent adhesive tape. Each print was then divided into quadrants and sextants and analysed using Tsuchihashi's classification. **Results:** 1) Lip print classification with quadrants yielded different results from classification using sextants. 2) There is strong evidence of an association between lip print types and ethnic groups. 3) Intra-examiner reproducibility was substantial and inter-examiner reproducibility was moderate. **Conclusion:** 1) Due to greater discriminatory power, it is recommended to use sextants for lip print analysis rather than quadrants. Sextants allow for a better representation of the lip types present. 2) Type I was the most frequent pattern in the White, Arab and Mixed groups, while Type IV was most common in the Black and Asians groups. Type III was least common in the White group, Type I in the Black and Asian groups, Type IV in the Arabs and Types IV and V in the Mixed group. 3) Lip print classification is reproducible.

Mating role model in Tengger ethnic group

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ABSTRACT

Endogamy mating role model from the genetic point of view could increase the frequency of homozygote genotype, and tend to be genetic drift of the population. Tengger ethnic group in Bromo Mountain, East Java, Indonesia live with their religion and culture heritance by their ancestors from generations. The culture made them married among their ethnic group and lived in the mountain.

The aim of this study was to explore the Tengger ethnic mating role model by doing deep interview from subjects, society and traditional leader group. The results showed that they had three type of mating role model : local endogamy (62,86%), exogamy (25,71%) and out side Tengger (11,43%). The Mean Matrimonial Radius (MMR) was 2,16-16,25 for subjects, 4,79-15,19 for the subject parents, 2,75-4,6 for the mother of the subject parents, and 1,68-6,5 for the father of the subject parents. The mating role model influence by their religion and culture that still maintained in their live until now.

Study of macroscopic and microscopic changes of dental tissues under the influence of thermal radiations: forensic interest in the modeling of a fire disaster

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ABSTRACT

Human tooth shows important features attesting its high ability to withstand post-mortem shocks caused by thermal activities. When bodies are seriously damaged by fire, the role of the forensic odontologist becomes even more essential during the identification process. This study was carried out in association with the Section of Engineering Fire in the Central Laboratory of Police of Paris (LCPP) using specific tools : the Calorimetric Cone(CC) and the ThermoGravimetric Analyzer(TGA).

The main objective of this study was to analyse the physico-chemical behaviours of the tooth when submitted to different thermal radiations: both macroscopic (using CC) and microscopic (using TGA) to define the macroscopic changes and the mass loss rate of dental tissues. This work intended to provide new tools to help investigators in the evaluation of fire scenarios.

Material and Methods: 33 samples of healthy teeth and 66 samples of dental tissues were collected from these 33 teeth. For the microscopic study (TGA), first study used 3 teeth and 6 samples of dental tissues to determine the repeatability and reproducibility of the TGA settings. Then, the healthy samples of dental tissues were burned and weighed from temperatures 25° to 1000°C with a heating rate of 10°C/min.

For the macroscopic study (CC), teeth were divided into 6 groups of 4 teeth and placed into 6 plates in order to reproduce the physiological dental environment of human teeth surrounded by alveolar bone. These plates were placed under different thermal radiations from 5 to 95 kW/m2 corresponding to internal temperatures in dental tissues of [100-600°]. The time of exposure was 30min which represents the average time of a fire in Paris. For each group, 4 photographies were taken at [T=0 ; 10 ; 20 ; 30 minutes] to characterize the macroscopic changes of the teeth when heated. Then, samples of dental tissues from these burned teeth were collected and another microscopic analysis were carried out to compare the difference of the mass loss rates between virgin and burned dental tissues.

Results: The microscopic study found that enamel do not lose mass when heated due to its strongly mineralized histological structure. However, on virgin samples, the cementum-dentin revealed three main reactions of mass loss : [280-400°C] ; [360-500°C] and [650-800°C] with the highest peak of mass loss found at 370°C.

For the macroscopic study, the results showed the dislocation

between the enamel crown and the underlying dentin around 350°C. The external dislocation of the enamel crown could be linked to the internal mass loss of the cementum/dentin that appears around 370°C.

Given the good repeatability of the observations made on the experiments, the results found are promising in the fire investigation field. Human teeth can be considered as a comparison point for further investigations in the LCPP. Teeth become the first organic indicator of fire modelling used in the scientific police investigation and could also be used in the case of fire mass disaster.

Study of mass loss of root canal materials under the influence of thermal radiations: forensic interest in the modeling of a fire disaster

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ABSTRACT

In oral cavity, dental roots are protected by the alveolar bone. The endodontic material is the most preserved dental material when bodies are severly burned such as during a fire disaster or aircrash when important thermal radiations are involved. This study followed a previous study based on dental tissues. This work was carried out in association with the Section of Engineering Fire in the Central Laboratory of Police of Paris (LCPP) using specific tools such as the Calorimetric Cone(CC) and the ThermoGravimetric Analyzer(TGA).

The main objective of this study was to analyse the degradation of the gutta-percha in combination or not to cement zinc-eugenol oxide when teeth are submitted to different thermal radiations both macroscopic (using CC) and microscopic (using TGA) in order to define the mass loss changes and thermogram of these root canal materials. This work intended also to provide further organic tools to help investigators in the modelisation of fire scenarios.

Material and Methods : 27 teeth were divided into 3 groups of 9 teeth and placed into 3 plates in order to reproduce the physiological dental environment of human teeth surrounded by alveolar bone. For each plates, on the 9 teeth, 3 of them were filled only with Gutta Percha, 3 others with Gutta Percha in combination to cement zinc-eugenol oxide, the last 3 teeth were filled only with cement zinc-eugenol oxide.

Two preliminary studies using TGA were carried out on root canal material in order to determine the repeatability and reproducibility of the settings : from 25 to 800°C and a heating rate of 10°C/min. Then, the 3 plates of 9 teeth were placed under the Calorimetric Cone with 3 different thermal radiations : 20, 35 et 50 kW/m2 and another TGA analysis was carried out on these burned samples.

Results : The results of this study bring to the reports that, when the gutta percha burns, it leaves an important quantity of residues compared with other polymers. Moreover, the gutta percha and the cement zinc-eugenol oxide revealed a reaction of mass loss between [540-765°C] which is the average temperature in a fire in Paris.

Following the previous study made on human teeth, the results found in this study are still promising in the fire investigation field and further investigations could also be made on the

alveolar bone. After a fire disaster, in the same way that the LCPP use inorganic burned materials found into a fire scene to modelise the fire scenario, such as plastic from a switch, 1mg of dental tissues and root canal material could also be used and considered as comparison points for the LCPP in case victim(s) would be present in the fire scene. Moreover, an estimation of the distance between the source of the fire and the position of the victim would also be possible to investigate using the modelisation system in the LCPP.

« Individuals X » in France : a project of standardization of unidentified bodies and missing persons data

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ABSTRACT

Each year in France, many unidentified corpses are found, in an extrajudicial context. Without appropriate research, they will be buried under X. This situation is an ethical and social issue, and a possible judicial problem.

In parallel, each year, a thousand of french individuals are déclared missing and not found. Their disappearing represents a real psychological torment for their families.

By these two observations, we conclude that, among this corpses burried under X certainly are missing persons, still researched by their family, and who are named here "Individuals X".

Despite different identification processes, other countries face with the same issue, and regarding to free movement of persons in the European Union, each have nowdays to take into account the fact that some of their nationals can disappear – and die – abroad. That's why the project we present here may have some interest at an international level.

Identification of Individuals X is necessarily based on an efficient comparison of post-mortem (PM) data collected during bodies examination, and "ante-mortem" (AM) data from missing persons files.

We propose here a model of PM and AM files, based on the DVI Interpol process, and so manually and computationally comparable.

Interpol forms, that have proven effective during the last mass disasters have been simplified, so they can be used in classical autopsy process, and completed by an additional "anthroplogical examination" part for specific cases.

Using this forms, in association with classical identification methods (dental, digital and genetic), and by anticipating an anthropological examination, should allow to bring back more corpses to their family, and so facilitate grieving and psychological repair.

Oral microbiome ecology changes as an approach of postmortem interval estimation

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ABSTRACT

Oral cavity harbours one of the most diverse microbiomes in the human body, it has been shown to be the second most complex in the body after the gastro-intestinal tract. Upon death, the indigenous microorganisms lead the decomposition of the carcass. So that, oral cavity and gastro-intestinal tract microbiomes, play a key role in human decomposition. The aim of the present study is to monitor both quantitatively and qualitatively the decay of signature bacterial species in order to use that information as a postmortem interval estimator.

Three donnated individuals (one male and two females) to the University of Tennessee Forensic Anthropology Center for the W. M. Bass Donated Skeletal Collection were studied. Oral swab samples were daily taken throughout the different stages of cadaveric putrefaction. DNA was extracted and analyzed by next generation sequencing techniques.

The three cadavers showed similar overall successional changes along decomposition process. *Firmicutes* and *Actinobacteria* are the predominant phyla in the fresh stage. *Tenericutes* presence corresponds to bloat stage. *Firmicutes* is the predominant phyla in advanced decay, being that *Firmicutes* community a different one from the predominant *Firmicutes* of the fresh stage.

This study depicts the thanatomicroniome successional changes in the oral cavity, and highlights its potential use in forensic cases as a quantitative and objective approach to estimate PMI, from an ecological rationale.

Role of lips print for forensic investigation

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ABSTRACT

Identification plays a major role in any crime investigation. Lips prints often appear on straws, glasses, cigarettes, and others. All of these are potential places where lip prints may be found and used in the investigation of a crime. Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lips traces. In the past decades, lip-print studies attracted the attention of many scientists as a new tool for human identification in both civil and criminal issues. Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin. A lip print may be revealed as a surface with visible elements of lines representing the furrows. This characteristic pattern helps to identify the individuals since it is unique for individuals. Lip print recording is helpful in forensic investigation that deals with identification of humans, based on lip traces

DVI ante-mortem management strategy: Indonesia experiences from major airline disasters

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ABSTRACT

The success of a DVI operation is determined by the management of five DVI phases and the ante and post mortem data collection. DVI Indonesia within the last few years had been carrying out a number of DVI operations, including the air transport accidents. Each case had different challenges to other cases. Therefore, we needed a good strategy in order to implement DVI procedures as efficiently as possible, to identify the disaster victims accurately, while maintaining the integrity of the entire DVI process. DVI ante-mortem management is one important keys to the success of identification, because in this phase the reported missing person is to be registered accurately, ante-mortem data is being collected with focus on three primary identifiers, as well as the importance of skillful DVI officers assigned to the complexity of ante-mortem duties. In this study, we reported how DVI Indonesia had implemented a management strategy of DVI ante-mortem operation.

Radiomorphometric analysis of mandibular ramus height and gonial angle for sex determination

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ABSTRACT

Background. Morphological features of mandible are important for sex determination in odontology forensic investigations. Mandible is a craniofacial bone that is large and strong, with different growth level, duration and mastication force among sex will eventually affect size and shape of mandibular ramus. Ramus height and gonial angle are the most stable characters in mandibular bone. Bone characteristics depend on population, consequently there should be specific standardization in each population.

Objective. To analyze ramus height and gonial angle using panoramic radiographs for sex identification in population of West Java, Indonesia.

Materials & Methods. 100 panoramic radiographs of male and female are collected. Ramus height were measured as the distance between coronion and the intersection of the orientation line with the inferior border of the ramus. Gonial angle were measured as the intersection between a digitally traced line tangential to the most inferior points at the angle and the lower border of the mandibular body and another line tangential to the posterior borders of the ramus and the condyle. The data were tabulated and were analized statistically

Results. Ramus height for male is higher (55.3 mm ± 3.85 mm) than female's (51.2 mm ± 3.07 mm) with p value 0.001, while gonial angle of male (121.91° ± 3.85°) is smaller than female's (124.86° ± 6.38°.) with p value 0.001

Conclusions. Ramus height and gonial angle measurement in this research demonstrated significant difference thus these can be used as parameters for sex identification.

Palatal rugae analysis in Indonesian males and females for sex determination

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ABSTRACT

Introduction: Palatal rugae analysis is one of secondary methods for sex determination. The morphology of a human's palatal rugae is considered very specific and has individual characteristics. Although palatal rugae has been reported showing various types in men and women, but it could still be beneficial for personal identification and sex determination. **The purpose of this study** was to analyze the types of palatal rugae in Indonesian males and females.
Methods: Types of palatal rugae from 100 maxilla casts (50 Indonesian males and 50 Indonesian females) were measured using a ruler and were analyzed using Lysell's classification.
Results: By using the Mann-Whitney test, secondary rugae type was found higher in Indonesian males than that of females and predominantly in the left palate ($p<0.05$), while fragmentary rugae was found higher in Indonesian females than that of males and predominantly in the right palate ($p<0.05$). Also, all types of palatal rugae were more frequently found in the left palate of Indonesian males than that of females ($p<0.05$).
Conclusions: The types of palatal rugae in Indonesian population were found to have significant differences between male and female groups. This fact supports sex determination in the Indonesian population.

Bite injuries in the Brazilian jurisprudence: analysis of 1125 lawsuits registered during the last 18 years

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ABSTRACT

The prevalence of lawsuits founded on physical violence reached alarming rates worldwide. Bite injuries figure in the jurisprudence as a specific type of aggression that may be assessed by forensic expert witnesses, namely forensic odontologists. From a criminal scope, these injuries may be assessed firstly to quantify bodily impairments (aesthetic and functional); and secondly to indicate how likely suspects are involved in crimes based on the relation of their dental traits with the bitemark patterned injury. Characterizing the jurisprudence involving bite injuries may contribute to highlight the importance of forensic odontologists in Court. The objective of this research is to screen the Brazilian jurisprudence for cases involving bite injuries and extract data that could contribute to further research and practice in the field of bitemarks. The open access jurisprudence was searched with the operators "bite" and "bitemark". Full-text lawsuits founded on indemnification based on physical aggression were selected. All the lawsuits retrieved (n=2488) were analyzed for data extraction. A total of 1125 lawsuits dated between 1997 and 2015 were considered eligible. Medical forensic expertises were requested by the Brazilian Courts in 641 lawsuits. In 3 cases the forensic odontologist performed bitemark analysis to indicate whether or not suspects could be involved in the crime. Lawsuits involving bite injuries increased gradually in the jurisprudence. Forensic odontologists have to be aware and skilled for practical expertises in the field. Training in forensic odontology must be provided and encouraged to enable optimal performances under the needs of justice .

Dentist's role as an expert in labor lawsuits in Brazil

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ABSTRACT

It's humanly impossible for a single Judge to dominate all sciences and technical knowledge about all the areas that lawsuits can involve. For that, the Judge, in Brazil, must indicate an expert in the corresponding subject of the litigation. The expert will then produce a report, whose content will give fundamentals that are important for the trial's result. In a dental context, this is not different from other areas and a dentist can contribute for expertise in all areas of law: criminal, civil, administrative and labor. The matter involves majorly cases that accidents originated from work and work diseases occur, which might also harm the teeth and/or oral cavity. The aim of this study was to elucidate accreditation procedures of these professionals in the 24 Regional Labor Courts (RLC) in Brazil (which are composed by one or two states at a time), as well as fees compensated to these experts, when the Court is responsible for the payment settle. To gather these information, a documental research was conducted, using websites of the 24 Courts and when the information online was unsatisfactory, an email was sent and a phone call made to the ombudsman service of the RLC. All the RLCs have proper accreditation procedures, that are in some cases by attending Court specific expert register services and in other ones digitalized. Concerning the fees, the Superior Labor Justice Council (SLJC) has declared, through Resolution number 66/2010, guidelines to standardize maximum values, responsibility for payment and possibilities for settlement anticipation prior to the expert report submission. Most of the RLCs follow the Resolution through individual regulations, however some of them surpass the maximum value established by the SLJC (R$ 1000,00), while others shorten the expense earned by the expert.

Forensic odontology for human rights group

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ABSTRACT

The Forensic Odontology for Human Rights International Working Group was inaugurated on May the 5th 2015 at the Annual Interpol DVI Meeting in Lyon. The Group seeks forensic odontologists and oral health professionals with forensic background to promote forensic odontology and forensic science principles to caseworks with the purpose of preventing Human Rights violations through the application of best practice in human identification, age estimation and where dental evidence is involved.

This presentation will highlight the importance of dental evidence in criminal investigations and the importance of a multidisciplinary approach involving all the experts needed for the best outcome of the forensic analysis. Teeth and jaws can provide a tremendous amount of information in the field of disaster victim identification, missing and unidentified persons, child abuse and neglect, domestic violence and sexual abuse with bite mark evidence, age estimation of unaccompanied minors, border control and human trafficking. This underlines the importance of promoting international co-operation between experts, also on a volunteer basis.

Forensic Odontology for Human Rights Group members are volunteering for forensic casework, teaching and scientific research in odontology and dentistry applied to forensic sciences.

It should be clear to all those involved in the process of human identification that an incomplete post mortem assessment can lead to a delayed identification and represents a violation of human rights and international humanitarian law. Forensic Odontology can lead to a swift identification of nameless cadavers also providing evidence to the families which may be used in Court, as in cases of genocide and mass graves or after a terroristic attack.

In the year since constitution the number of members of Forensic Odontology for Human Rights has risen to 39 experts in Forensic Odontology from 16 different Countries: Australia, Brazil, Canada, Croatia, France, Hong Kong, Hungary, Israel, India, Indonesia, Italy, Pakistan Saudi Arabia, Spain, Sweden, Thailand and the United States of America.

Given the low numbers of well-trained and experienced Odontologists around the world today and the risk of omitting odontological assessment where appropriate, Forensic Odontology for Human Rights can be utilised as a resource to prevent human rights violations by promoting routine involvement of odontologists and best practice in odontological assessments and human identification.

Body damage evaluation and temporomandibular disorders

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ABSTRACT

Background and Aims: In order to promote body damage evaluations supported by justice and equality, emerged table-guides.
The assessment of disability within the temporomandibular joint (TMJ) is characterized by the presence of an altered functional state - temporomandibular disorders (TMD).
Materials and Methods: The diagnosis of any temporomandibular disorder is made by analyzing the signs and symptoms of the patient in a three way analysis: muscular/articular/sensitive. For a correct diagnosis, protocols should be used, such as the Research Diagnostic Criteria for Temporomandibular joint disorders (RDC / TMD). We will analyse a series of cases, with TMD inability and also make a critical analysis of the table-guide that is used in Portugal the National Table for Permanent Disability Evaluation in Civil Law, establishing an analogy with " Le Guide Barème Européen d' évaluation médicale des atteintes à l'intégrité physique et psychique " in relation to the evaluated parameters of ATM and their scores.
Results and Discussion: The results presented in this study support an overestimation of this item under Civil Law. When making a comparative analysis with European guidelines we find it possible to establish similar correlations.
Conclusions: Despite the pure informational value given by table-guides, they are aimed for helping the medico-legal expert on equitable evaluation of victims, regarding the evaluation of DTM. Table-guides should be used based on the diagnoses done with clinical protocols and translate the various degrees of severity in different scores, thus standardizing the assessments made in the different types of law.

A comparative study on the method of age estimation using measurement of mandibular first molars on radiographs in Korean adults

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ABSTRACT

In the practical forensic medicine, age estimation is of great importance to identification of human remains, as well as with living persons. Especially in Korea, demand for age estimation is increasing to correct personal birth records, ultimately to be entitled to civil liability, social benefits, employment.

The spontaneous shrinkage of pulp cavity size as a result of secondary dentin deposit could be used to estimate age. This regressive change can be analyzed using radiological technologies. Various methods of dental age estimation were proposed based on this approach. The purpose of this study is to assess the two methods using the mandibular first molar on orthopantomographs (OPGs) in Korean adults, called Drusini's method and Jeon's method respectively. A total of 232 OPGs (91 females and 141 males) of Korean individuals between the ages 20 and 69 were analyzed using both methods. Our results showed that the correlation of the two methods with age was statistically significant (r=0.501). Both methods showed significant correlation with chronological age, and Jeon's method showed a greater correlation with chronological age (r=0.738) than Drusini's(r=0.586). The mean absolute error was 7.99 years for Jeon's method and 9.79 years for Drusini's method. Our results demonstrate that Jeon's method using the mandibular first molar on OPGs is a practical and suitable method for age estimation especially in Korean adults.