Triennial Congress of the International organization for Forensic Odonto-Stomatology: Programme & Book of abstracts

I·O·F·O·S
50th Anniversary

75th Anniversary

Triennial Congress of the

International Organization for Forensic Odonto-Stomatology

organized by

School of Dental Medicine University of Zagreb
Croatian Association of Forensic Stomatologists

Programme & Book of abstracts

Dubrovnik, Croatia
September 6 – 8, 2023

www.iofos2023.com
www.iofos.eu

IMPRESUM

Triennial Congress of the International Organization for Forensic Odonto-Stomatology (IOFOS),
September 6 – 8, 2023, Dubrovnik, Croatia

President of the IOFOS Congress 2023
Hrvoje Brkić (Croatia)

Editors of the Programme & Book of abstracts
Jelena Dumančić, Ivana Savić Pavičin (Croatia)

Organising Committee of the IOFOS Congress 2023
Sandra Anić Milošević (Croatia)
Luka Banjšak (Croatia)
Jelena Dumančić (Croatia)
Ivan Galić (Croatia)
Stefano Garatti (Italy)
Vedrana Petrovečki (Croatia)
Ivana Savić Pavičin (Croatia)
Zrinka Tarle (Croatia)
Marin Vodanović (Croatia)

Scientific Committee of the IOFOS Congress 2023
Ashith Acharya (India)
Kurt W. Alt (Austria)
John Berketa (Australia)
Herman Bernitz (South Africa)
Ricardo Henrique Alves da Silva (Brazil)
Roberto Cameriere (Italy)
Ivana Čuković-Bagić (Croatia)
Myroslav Y. Goncharuk Khomyn (Ukraine)
Rüdiger Lessig (Germany)
Cristiana Palmela Pereira (Portugal)
Vilma Pinchi (Italy)
Svend Richter (Island)
Tore Solheim (Norway)
Patrick Thevissen (Belgium)

IOFOS Executive Board 2020 – 2023
Hrvoje Brkić (Croatia), president
Rüdiger Lessig (Germany), vice-president
Ricardo Henrique Alves da Silva (Brazil), secretary
Vilma Pinchi (Italy), JFOS editor
Stefano Garatti (Italy), Webmaster
Patrick Thevissen (Belgium), treasurer

Editor of the IOFOS Newsletter
Marin Vodanović (Croatia)

PUBLISHER
International Organization for Forensic Odonto-Stomatology &
School of Dental Medicine University of Zagreb, 2023

ISBN 978-953-7781-18-7 (Print)
ISBN 978-953-7781-19-4 (Online)

Welcome letter of the IOFOS President

Dear colleagues and friends,

I greet you on behalf of the Organising and Scientific committees, and on my own behalf on the occasion of the upcoming Triennial Congress of the International Organization for Forensic Odonto-Stomatology (IOFOS). The congress will be held in Dubrovnik, Croatia, on the premises of the University of Dubrovnik from September 6 to 8, 2023. The congress is co-organized by the School of Dental Medicine University of Zagreb and the Croatian Society of Forensic Stomatologists.

Eighty-five presentations from thirty-five countries completely filled the minutes of the two congress days.

In addition to scientific and expert presentations in the form of oral, student presentations competing for the best presentation and ePosters as 3-minute flash oral presentations, the congress is preceded by six half-day workshops intended primarily for students, but also for all other interested participants.

During the congress, we will celebrate the 50th anniversary of IOFOS, because in 1973 IOFOS started its work at the FDI World Congress in Paris. From then until today, its basic missions are: raising knowledge, scientific research in the field of forensic odontology and expanding the network of international cooperation.

Several social gatherings are planned, such as: a welcome reception at Sponza Palace, a tour of the Old Town, a conference dinner and a one-day trip to the Pelješac peninsula with a variety of food and wine. The registration fee is divided into three categories: all participants, students and accompanying persons". The official language of the congress is English.

We look forward to your participation and making IOFOS bigger, stronger and celebrating its 50th birthday!

Professor Hrvoje Brkić, President of the IOFOS

Welcome letter of the mayor of Dubrovnik

Dear all,

on the occasion of the Triennial Congress of the International Organization for Forensic Odonto-Stomatology I express mine and City's administration satisfaction that this valuable event in the field of medicine and odontology, will be held in Dubrovnik, the city of sustainable tourism and the pearl of the Adriatic.

Throughout the centuries, Dubrovnik has been at the forefront of many larger and stronger European communities of the time. Dubrovnik Republic has made great strides in healthcare, social care, arts, and socio-political organization. Thanks to its skillful trade and diplomacy, former city/state successfully maintained freedom and resisted many forces of that time.

Dubrovnik's potential for prosperity and international recognition was realized not only in the fields of diplomacy, trade and maritime affairs but also in the quality of life and healthcare provided to its residents. The rich history of this ancient city is marked by the tradition of pharmacology and pharmacy, initiated by religious orders. Dubrovnik is also a home of the world's oldest quarantine, Lazareti complex.

In order to preserve all the efforts and achievements left to us by our ancestors, we have responsibly and with a clear aspiration continued to support medical professionals and institutions in their selfless and noble calling. We offer them the best working conditions to ensure a high standard of living for the people of Dubrovnik and a pleasant stay for visitors.

Today, tourism is the strong engine of economic development in modern Dubrovnik, a beloved Mediterranean center. Responsible management and sustainable destination policies are the key to success and international recognition earned through the implementation of the strategic city project "Respect the City". This initiative has fully come to life and gained its purpose over the years, offering solutions for excessive crowds, providing guests with a unique and unforgettable experience, and placing the citizens at the forefront, following old Dubrovnik's principles of measure and harmony.

The fundamental purpose of the synergy between the municipality and local and international stakeholders is to protect the authenticity and integrity of the values of southern Croatia, to care for the historical core, cultural and monumental heritage, natural attractions, and to advance universal material and immaterial components based on sustainable principles that guarantee durability and enable the integration of smart management models.

I invite you to use this occasion to explore the enchanting symbols of Dubrovnik, listed as UNESCO World Heritage. This picturesque and impressive place is truly worth your attention.

Mayor of Dubrovnik,
Mato Franković

Programme

WEDNESDAY, September 6

9.00 – 12.00

WORKSHOP 1 Human Identification by Comparative Dental Analysis in Disaster Victim Identification
Cristiana Palmela Pereira & Ricardo Henrique Alves da Silva, University of Lisbon & University of Sao Paulo

WORKSHOP 2 Bite mark analysis: understanding the concepts of 3D pattern fit and addressing the realities of distortion and cognitive bias
Herman Bernitz, University of Pretoria

WORKSHOP 3 AgEstimation project
Roberto Cameriere & Ivan Galić, University of Macerata & University of Split

12.00 – 15.00

WORKSHOP 4 Application of artificial intelligence in forensic dentistry
Marin Vodanović, Marko Subašić & Denis Milošević, University of Zagreb

WORKSHOP 5 ASUDAS scoring system – the application of tooth morphology in ancestry estimation
Jelena Dumančić & Ivana Savić Pavičin, University of Zagreb

WORKSHOP 6 How to write and publish articles in forensic odontology
Vilma Pinchi, Francesco Pradella & Ilenia Bianchi, University of Florence

20.30 – 22.00

Welcome reception - Sponza Palace, Dubrovnik Old Town

THURSDAY, September 7

HALL A

8.15 – 9.00

OPENING CEREMONY
Professor Zrinka Tarle, *Dean of the School of Dental Medicine University of Zagreb*
Professor Nikša Burum, *Rector of the University of Dubrovnik*
Mr. Mato Franković, *The Mayor of Dubrovnik*
Professor Hrvoje Brkić, *President of the IOFOS*

9.00 – 10.20 **INVITED LECTURES I**
Chairs: Sigrid I. Kvaal & Hrvoje Brkić

9.00 – 9.20 **IL1** Fifty years of IOFOS (1973 – 2023): a historical overview
Eddy De Valck, Belgium

9.20 – 9.40 **IL2** Education in Forensic Odontology - a Brazilian experience
Richardo Henrique Alves da Silva, Brazil

9.40 – 10.00 **IL3** Accredited programmes of postgraduate education in forensic odontology
Cristiana Palmela Pereira, Portugal

10.00 – 10.20 **IL4** Interpol DVI Working Group – a report from the Forensic Odontology Subworking Group
Rüdiger Lessig, Germany

10.20 – 10.50 COFFEE BREAK

10.50 – 12.20 **Oral presentations IDENTIFICATION I**
Chairs: Vilma Pinchi & Rüdiger Lessig

10.50 – 11.00 **O1** Salivary protein profile - a tool for forensic identification
Archana Muralidharan, India

11.00 – 11.10 **O2** Digital reproducibility of the palate utilizing intraoral scanners and its significance in human identification
Akos Mikolicz, Orsolya Gaspar, Botond Simon, Arvin Shahbazi, Janos Vag, Hungary

11.10 – 11.20 **O3** Mobile images in the visualisation of characteristic dental features
Vimbai Magagula, Herman Bernitz, Christy Davidson, Paul van Staden, Joyce Jordaan, South Africa

11.20 – 11.30 **O4** Need for the new dental identification system during ongoing war in Ukraine
Yevhen Kostenko, Myroslav Goncharuk-Khomyn, Volodymyr Mishalov, Ukraine

11.30 – 11.40 **O5** Effectiveness of digital dentistry advances for the forensic odontology practice
Myroslav Goncharuk-Khomyn, Wayne Hirschowitz, Ukraine

11.40 – 11.50 **O6** Investigating the influence of sex and ethnicity on human identification using palatal scans
Botond Simon, Aida Roudgari, Akos Mikolicz, Arvin Shahbazi, Janos Vag, Hungary

11.50 – 12.00 **O7** Forensic inspection of palate deterioration in animal models based on morphological and digital aspects
Arvin Shahbazi, Sandor Miko, Janos Vag, Hungary

12.00 – 12.10 **O8** Analysis of enamel peptides: assessing the applicability of a new method of sex estimation in forensic analysis of human skeletal remains
Iztok Štamfelj, Robert Vidmar, Marko Fonović, Slovenia

12.10 – 12.20 Discussion

12.20 – 13.00 LUNCH BREAK

13.00 – 14.20 **Oral presentations IDENTIFICATION II**
Chairs: Scheila Manica & Francesco Pradella

13.00 – 13.10 **O9** Post Mortem Interval (PMI) estimation method using RNA degradation pattern and gene expression in human dental pulp under varied time intervals
Shalini Gupta, India

13.10 – 13.20 **O10** Workflow of a multi-institution collaboration for anthropology and forensic facial reconstruction of unknown skeletons in Brazil
Thiago L Beaini, Janina P Curi, Leticia V Santos, Carla R Machado, Sergio V Cardoso, Rodolfo F H Melani, Brazil

13.20 – 13.30 **O11** Exploring the handling of tooth remains in human identification
Chinmaya Subudhi, Ademir Franco, Scheila Manica, UK

13.30 – 13.40 **O12** Forensic odontology identification approach without dental records
Khalid Khalid, Sudan

13.40 – 13.50 **O13** A pilot study on post-mortem determination of drug abuse on dental tissues
Ilenia Bianchi, Marta Cippitelli, Erika Buratti, Vilma Pinchi, Mariano Cingolani, Italy

13.50 – 14.00 **O14** Post-mortem mutations in dental DNA as a measure for Post-Mortem Interval (PMI)
Ilenia Bianchi, Francesco Pradella, Veronica Pennati, Irene Migliastro, Francesca Castiglione, Vilma Pinchi, Italy

14.00 – 14.10 **O15** The use of medical imaging and 3D methods in the identification of human remains from the mass graves on the grounds of the former Poznan NKVD camp
Dorota Lorkiewicz-Muszynska, Jan Jagiello, Agata Wasewicz-Madejek, Julia Sobol, Jedrzej Oberc, Marzena Labecka, Grzegorz Teresinski, Agnieszka Cugier, Mariusz Glapinski, Pawel Swiderski, Damian Rusek, Poland

14.10 – 14.20 Discussion

14.20 – 15.40 **Oral presentations EDUCATION IN FORENSIC ODONTOLOGY**
Chairs: Christiana Palmela Pereira & Marin Vodanović

14.20 – 14.30 **O16** Becoming a forensic dentist - a discussion on the teaching-learning process
Scheila Manica, UK

14.30 – 14.40 **O17** Forensic odontology guidelines: a scoping review
Cezar Capitaneanu, Anca Iliescu, Ioana Maris, Gabriel Fonseca, Chile

14.40 – 14.50 **O18** The evolution of forensic odontology education in Indonesia
Nurtami Soedarsono, Masniari Novita, Mindya Yuniastuti, Elza I. Auerkari, Indonesia

14.50 – 15.00 **O19** Perception regarding forensic odontology among the undergraduate students of Northern India
Harmanpreet Kaur, Ridhi Narang, India

15.00 – 15.10 **O20** Correlation between forensic odontology knowledge and the interest as forensic odontologists
Masniari Novita, Kumara Pandya Fahar Aptanta, Dwi Kartika Apriyono, Indonesia

15.10 – 15.20 **O21** Transmission of knowledge from an experienced forensic odontologist to the new beginner
Silje Arnet Evje, Sigrid I. Kvaal, Norway

15.20 – 15.40 Discussion

15.40 – 16.00 COFFEE BREAK

16.00 – 16.50 **Oral presentations MEDICO-LEGAL FIELD**
Chairs: Gwenola Dragou Saout & Ashith B. Acharya

16.00 – 16.10 **O22** Medicolegal risk management of dental injuries during orotracheal intubation by the new custom-made dental protective splint
Emilio Nuzzolese, Giulio Rosboch, Davide Santovito, Francesco Lupariello, Giancarlo Di Vella, Italy

16.10 – 16.20 **O23** War crime investigation
Svend Richter, Iceland

16.20 – 16.30 **O24** Orofacial lesions identified in the medicolegal autopsy. A case report - WITHDRAWN
Gabriel M. Fonseca, Chile

16.30 – 16.40 **O25** Prevalence of bodily injuries in women assisted by scientific police in relation to Covid-19 pandemic
Larissa Barros Costa, Luiz Fernando Lolli, Brazil

16.40 – 16.50 Discussion

17.00 All together photo

HALL B

14.20 – 16.50 **STUDENT ORAL PRESENTATIONS – COMPETITION**
Chairs: Ricardo Henrique Alves da Silva, Jelena Dumančić, Iztok Štamfelj

14.20 – 14.30 **SP1** Dental age assessment using a deep learning approach
Valon Nushi, Rui Santos, Arlindo Oliveira, Alexandre Francisco, Hrvoje Brkić, Cristiana Palmela Pereira, Portugal

14.30 – 14.40 **SP2** Dental Age Assessment by Portuguese Scoring Systems Tables
Ana Rodrigues, Valon Nushi, Rui Santos, Francisco Salvado, Cristiana Palmela Pereira, Portugal

14.40 – 14.50 **SP3** Artificial intelligence for dental radiographic age estimation on a Brazilian population
Anna Lygate, Scheila Manica, Hemlata Pandey, Ademir Franco, UK

14.50 – 15.00 **SP4** Scoping review of Forensic Odontology training programmes based on the World Wide Web resources
Ranya Al Ghazi, Alexander Gardner, Peter Mossey, Mark Hector, Scheila Manica, UK

15.00 – 15.10 **SP5** Testing of the accuracy and reliability of automated dental status registration based on convolutional neural networks
Ajla Zymber Ceshko, Marko Subašić, Denis Milošević, Ivana Savić Pavičin, Marin Vodanović, Croatia

15.10 – 15.20 **SP6** Eyeball position in facial reconstruction employing Cone-Beam Computed Tomography (CBCT) from Brazilian population
Letícia Vilela Santos, Thiago Leite Beaini, Gabriela Nobre Silva, Rodolfo Francisco Haltenhoff Melani, Brazil

15.20 – 15.40 **SP7** Biological profiling using the human mandible A Systematic review
Doha Abualhija, Julieta Gomez Garcia-Donas, Simon Shepherd, Scott McGregor, Ademir Franco, Scheila Manica, UK

15.40 – 15.50 **SP8** Dentists and child abuse and neglect, a review
Diana Astori Nogueira, Cristina Paiva Figueiredo, Ivana Čuković-Bagić, Portugal

15.50 – 16.00 **SP9** Automatic tissue removal from 3D dental photoscans
Anika Kofod Petersen, Andrew Forgie, Dorthe Arenholt Bindslev, Palle Villesen, Line Staun Larsen, Denmark

16.10 – 16.20 **SP10** Sensitivity and Specificity of Quantitative Methods for Sexual Diagnosis
Diana Augusto, Rui Santos, Ana Rodrigues, Vitoria Ionel, Cristiana Palmela Pereira, Portugal

16.20 – 16.40 **SP11** Sex and Age Determination Using Raman Spectra of Dentine
Luka Banjšak, Ozren Gamulin, Minja Birimiša, Marin Vodanović, Hrvoje Brkić, Croatia

16.40 – 16.55 Discussion

17.00 – 17.15 All together photo

20.30 – 22.00 Dubrovnik old town tour

FRIDAY, September 8

8.15 – 10.00 **INVITED LECTURES II**
Chairs: Anastasia Mitsea & Thiago L Beaini

8.15 – 8.35 **IL5** Calais migrant identification in November 2021
Gwenola Dragou Saout, Lise Malfroy Camine, Michael Guigon, Aymeric Leguillier, Anne Becart, Cecile Wallaert, Aime Conigliaro, France

8.35 – 8.55 **IL6** Dental malpractice in Italy: major and minor events and legal consequences
Vilma Pinchi, Italy

8.55 – 9.15 **IL7** The uniqueness of the human dentition revisited: a logical approach to the current impasse
Herman Bernitz, South Africa

9.15 – 9.35 **IL8** Forensic age assessment. AGFAD recommendations and new developments: a review
Andreas Schmeling, Germany

9.35 – 9.55 **IL9** Quality assurance and IOFOS
Tore Solheim, Norway

10.00 – 10.20 Coffee break

10.20 – 12.20 **Oral presentations AGE ESTIMATION**
Chairs: Andreas Schmeling & Ivana Čuković-Bagić

10.20 – 10.30 **O26** 5-Part tooth segmentation method using CBCT and machine learning models for dental age estimation in adults
Rizky Merdietio Boedi, Simon Shepherd, Scheila Manica, Ademir Franco, UK

10.30 – 10.40 **O27** Validation of non-invasive dental feature-based age estimation methods for Korean adults with panoramic radiographs
Sang-Seob Lee, Sehyun Oh, South Korea

10.40 – 10.50 **O28** Automated assessment for dental age
Salem Altalie, United Arab Emirates

10.50 – 11.00 **O29** Dental age estimation based on 3-D Measurements of root dentin translucency: a pilot study
Muhammad Zaid Zainuddin, Tan Su Keng, Noor Shafini Mohamad, Mohd Yusmiaidil Putera Mohd Yusof, Malaysia

11.00 – 11.10 **O30** Dental age estimation based on cement thickness
Minja Birimiša, Jelena Dumančić, Marin Vodanović, Sandra Anić Milošević, Marina Marić, Hrvoje Brkić, Croatia

11.10 – 11.20 **O31** The Demirjian method adapted for dental age estimation in the Croatian population
Ivan Bedek, Jelena Dumančić, Tomislav Lauc, Miljenko Marušić, Ivana Čuković-Bagić, Croatia

11.20 – 11.30 **O32** A syncretism of Demirjian and Kohler developmental stages for a more accurate age estimation
Ashith B Acharya, Poonam Prakash, India

11.30 – 11.40 **O33** Secondary dentine as an indicator of adult age: a 3D CBCT method for age estimation based on pulp chamber narrowing of central incisors
Giulia Vitale, Ilenia Bianchi, Francesco Pradella, Vilma Pinchi, Ugo Santosuosso, Lorella Bonaccorsi, Italy

11.40 – 11.50 **O34** Effects of model complexity and hyperparameter optimisation on deep learning based dental age estimation on panoramic radiographs
Barkin Buyukcakir, Jeroen Bertels, Jannick De Tobel, Patrick W. Thevissen, Peter Claes, Dirk Vandermeulen, Belgium

11.50 – 12.00 **O35** Dental age estimation in Greek children based on the Demirjian method
Anastasia Mitsea, Aliki Rontogianni, Kety Karayianni, Greece

12.00 – 12.10 **O36** Automated age and sex estimation from OPGs using artificial intelligence
Marin Vodanović, Marko Subašić, Denis Milošević, Croatia

12.10 – 12.20 Discussion

12.20 – 13.00 Lunch break

13.00 – 13.40 **Oral presentations BITE MARKS**
Chairs: Herman Bernitz & Ivana Savić Pavičin

13.00 – 13.10 **O37** Bite marks - a critical comparison of methods
Nikola M. Ekin and Rüdiger Lessig, Germany

13.10 – 13.20 **O38** A systematic review of cognitive bias how it affects bite mark analysis and steps to prevent or mitigate against it
Menaka Naidoo, Liam Robinson, Herman Bernitz, South Africa

13.20 – 13.30 **O39** The role of bitemarks analysis in forensic identification: a systematic review
Nikolaos Christoloukas, Anastasia Mitsea, Aliki Rontogianni, Cristos Angelopoulos, Greece

13.30 – 13.40 Discussion

13.40 – 14.50 **Oral presentations DENTAL & CRANIOFACIAL ANTHROPOLOGY**
Chairs: Cezar Capitaneanu & Priyanka Kapoor

13.40 – 13.50 **O40** Cranial metric patterns in Brazil: characteristics and issues
Victor Jacometti, Marco Aurelio Guimaraes, Luis Otavio Carvalho de Moraes, Sergio Ricardo Marques, Eugenia Cunha, Ricardo Henrique Alves da Silva, Brazil

13.50 – 14.00 **O41** Madibular bone quality in three different archeological series from Croatia
Ivana Savić Pavičin, Anita Adamić Hadžić, Tadej Čivljak, Tomislav Lauc, Ajla Zymber Ceshko, Mario Šlaus, Croatia

14.00 – 14.10 **O42** Croatian population variation in canine distal accessory ridge
Jelena Dumančić, G. Richard Scott, Sandra Anić-Milošević, Nataša Medančić, Hrvoje Brkić, Croatia

14.10 – 14.20 **O43** Dental characteristics in prehistoric population from archaeological site Kopilo - region of central Bosnia and Herzegovina
Selma Zukić, Edin Bujak, Mario Gavranović, Naris Pojskić, Bosnia and Herzegovina

14.20 – 14.30 **O44** Association of non-metric dental traits using ASUDAS system in malocclusions: an aid to craniofacial identification
Priyanka Kapoor, Deepika Bablani Popli, Aman Chowdhry, Mariam Siddiqui, Anurag Negi, Srikant Natarajan, India

14.30 – 14.40 **O45** Inorganic and organic differences analysis in mapping of human teeth tissues
Katarzyna Sarna-Boś, Kamil Skic, Patrycja Boguta, Agnieszka Adamczuk, Marin Vodanović, Renata Chałas, Poland

14.40 – 14.50 Discussion

14.50 – 15.40 **e-POSTER PRESENTATIONS**

Chairs: Selma Zukić & Tore Solheim

PP1 The Influence of Third Molar Hypodontia on Dental Age Estimation
Aida Selmanagić, Muhamed Ajanović, Anita Bajsman, Selma Tosum-Pošković, Lejla Redžepagić-Vražalica, Azra Jelešković, Bosnia and Herzegovina

PP2 Comparison of the accuracy of dental age estimation in East Asian countries using Demirjian's method
Akiko Kumagai, Sang-Seob Lee, Japan & South Korea

PP3 The applicability of convolutional neural networks for age classification on panoramic radiographs of the Korean population
Byung-Yoon Roh, Won-Joon Lee, Eui-Joo Kim, Yo-Seob Seo, Ji-Won Ryu, Jong-Mo Ahn, South Korea

PP4 Neonatal line in forensic age assessment, a case report
Jaana Hurnanen, Finland

PP5 Validation of Belgrade Age Formula (BAF) for age estimation on Bosnian children population
Ksenija Zelić Mihajlović, Aida Selmanagić, Serbia & Bosnia and Herzegovina

PP6 Facial analysis by photo-anthropometry in three-dimensional images for age estimation purposes
Julia Schott de Matos, Paulo Henrique Viana Pinto, Caio Henrique Pinke Rodrigues, Aline Thais Bruni, Marco Antonio Moreira Rodrigues da Silva, Ricardo Henrique Alves da Silva, Brazil

PP7 Diagnostic and Treatment Challenges of Permanent Mandibular Molars with Accessory Roots - A Retrospective Clinical Study
Lucija Strmšek, Iztok Štamfelj, Slovenia

PP8 Comparative analysis of temporomandibular joint by means of CBCT and panoramic radiography in patients with and without osteoarthritis
Matea Prenc, Tomislav Badel, Dijana Zadravec, Sandra Anić Milošević, Mia Smoljan Basuga, Ivana Savić Pavičin, Croatia

PP9 Forensic odontology analysis of human remains found in Antarctica
Lidia Bravo Rodriguez, Spain

PP10 Composite restorations visualized by UV light
Line Staun Larsen, Jane Vestergaard Johansen, Hannah Sophie Antonia Duncker, Dorthe Arenholt Bindslev, Denmark

PP11 Police awareness of the need of primary identification methods
Mari Metsaniitty, Tiia Gronberg, Jukka Palo, Finland

PP12 How to compare dental findings between antemortem and postmortem radiographs for personal identification - Eye tracking pilot study
Maki Ohtani, Shoken Suzuki, Yuhei Matsuo, Sohtaro Mimasaka, Japan

PP13 Estimation of postmortem interval through histological analysis of buried teeth - preliminary results
Gabriel Fernandes Chaves Arantes de Carvalho Gomes, Cindy Maki Sato, Victor Jacometti, Dimitrius Leonardo Pitol, Karina Fittipaldi Bombonato Prado, Joao Paulo Mardegan Issa, Ricardo Henrique Alves da Silva, Brazil

PP14 Analysis of oral cavity and teeth profile findings for identification in cases of drowning victims: a case report
Eko Prastyo, Nurtami Soedarsono, Mindya Yuniastuti, Elza Ibrahim Auerkari, A. Winoto Suhartono, Ade Firmansyah Sugiharto, Oktavinda Safitry, Indonesia

PP15 Forensic odontology in human identification
Ammar Teboul, Samia Mouffok, Algeira

PP16 Age and Sex Determination in an Archaeological Sample in Croatia
Marina Marić, Dinko Radić, Jelena Dumančić, Marin Vodanović, Davorka Radovčić, Minja Birimiša, Hrvoje Brkić, Croatia

Discussion

15.40 – 16.00 Coffee break

16.00 – 17.15 **GENERAL ASSEMBLY – 50th ANNIVERSARY of the IOFOS**
Awards to the past Presidents of the IOFOS
Student presentations awards
Report of the President for the period from 2020 to 2023
Financial report for the period from 2020 to 2023
JFOS editor's report for the period from 2020 to 2023
Proposal to include newsletter editor in the Executive board
Presentation of the program of the candidates for the new President
Election of the new President of the IOFOS
A message of the new President
Closing of the Congress

20.30 – 23.00 **Congress dinner - cruise on the ship from the "Game of Thrones"**

Presenter instructions

The official congress language is English.

ORAL PRESENTATIONS

- Presentation software is Windows PowerPoint 16:9 (other formats are not accepted).
- Please do not bring your own laptops.
- Speakers are asked to hand in their presentations to the attendant in advance (latest before the beginning of the appropriate session).
- Time limit SHARP: 10 minutes, invited lectures: 20 minutes.
- Discussions will be only at the end of each session.

e-POSTER PRESENTATIONS

- E-posters will be presented as a 3-minute flash oral presentations.
- Please prepare an e-poster in pdf format. The e-poster must be on one page, in 16:9 format, LANDSCAPE ORIENTATION.
- Fonts: Arial, font size: 14+
- Animations and videos are not allowed on the poster.
- Document size: up to 10 MB

STUDENT ORAL PRESENTATIONS – COMPETITION

- Time limit SHARP: 10 minutes
- A three-member committee will assess the quality of the research and presentation
- The three best presentations will be awarded with special gifts and medals

WORKSHOPS

W1 Human Identification by Comparative Dental Analysis in Disaster Victim Identification

Workshop leader/s: Cristiana Palmela Pereira & Ricardo Henrique Alves da Silva, University of Lisbon & University of Sao Paulo

The establishment of a positive identification of unknown human remains by comparative dental analysis requires the submission of supporting documentation from the dental provider (s) who treated the patient, the missing person, as well as careful documentation of the unidentified remains. Human Identification by dental analysis is the comparison of oral maxillofacial structures. The procedures to reconcile this information (e.g., radiographs, charts, and progress notes) have been outlined by numerous forensic organizations including the International Organization of Forensic Odonto-Stomatology (IOFOS), American Board of Forensic Odontology (ABFO), British Association of Forensic Odontology (BAFO), INTERPOL's DVI Steering Committee and Forensic Odontology Subcommittee as well as many others. The consequences of a misidentification can have emotional and legal ramifications well beyond a specific case. Thus, using the proper method and procedure for such method(s) of human identification is of the most importance. Dental identification is the most common method of identifying human remains that are decomposed, burned, fragmented, or skeletonized. This identification is accomplished by conducting a thorough postmortem dental examination, the collection of antemortem dental and medical records, and the comparison of the postmortem evidence with the antemortem record. It is imperative that the proper procedures be followed, and that meticulous attention is paid to the detail of the postmortem examination and comparison to the antemortem dental record.

The goals of this workshop are:

- To provide the best available current information on the best practices recommended by the forensic odontology community. It includes already published guidelines on how to obtain comparative forensic dental data as well as the recommended methodologies to reconcile that data in order to establish an identification by comparative dental analysis.
- To create awareness and education for the dental practitioner on the forensic odontology identification process as well as understand what information may be required should the need for them to participate occurs.

W2 Bite mark analysis: understanding the concepts of 3D pattern fit and addressing the realities of distortion and cognitive bias

Workshop leader/s: Herman Bernitz, University of Pretoria

The workshop will address the practical aspects of bite mark analysis. It will address the issues of macroscopic and microscopic 3D pattern fit, both digitally and with the help of models. It will show how to capture the suspect's bite, to be able to perform a one-on-one analysis of the bite mark evidence. The importance of weighting dental features within a specific population will be addressed with relevant case studies. All aspects of warping, shrinkage and distortion will be explained in the context of giving expert witness in court cases related to bite marks. The realities of cognitive bias will also be explained. The difference in analysis techniques between skin bite marks and those found in inanimate objects will be discussed and demonstrated. The interrelationship between microscopic analysis and the uniqueness of the dentition will be dealt with. The participants will be assisted in practicing the relevant techniques.

W3 AgEstimation project

Workshop leader/s: Roberto Cameriere & Ivan Galić, University of Macerata & University of Split

Age estimation is one of the most important problems both in forensic and anthropology matters. Teeth are the body parts most commonly used for age determination. The apposition of secondary dentine has been particularly used, especially in recent years. Previous studies have focused on the use of canines. The workshop will explain the techniques of the AgEstimation project and the results obtained. All methods based on the use of teeth will be illustrated. Participants will have the opportunity to evaluate both the techniques for assessing age in children by studying the open apices of the lower teeth. The probability to know if a subject is or not 18 years old by third molar, and finally, the study of the relationship between the pulp and apex of the canine in adults. The work shop will be prodromal for subsequent practical meetings.

W4 Application of artificial intelligence in forensic dentistry

Workshop leader/s: Marin Vodanović, Marko Subašić & Denis Milošević, University of Zagreb

The workshop will be divided into two parts. The first part of the workshop will give a brief overview of current methods for age and sex estimation in adults using orthopantomograms and present the possibilities of using artificial intelligence in forensic dentistry for this purpose. In the second part of the workshop, participants will estimate age and sex of adults from orthopantomograms using anthropological parameters and specially developed software for age and sex determination. It is desirable, but not mandatory, that workshop participants bring a laptop or tablet to work with.

W5 ASUDAS scoring system – the application of tooth morphology in ancestry estimation

Workshop leader/s: Jelena Dumančić & Ivana Savić Pavičin, University of Zagreb

Tooth morphology is an element of human dentition that is largely a reflection of the genetic background. Variations in tooth morphology reflect evolutionary changes while in living populations a pattern of geographic variation, according to which we can draw conclusions about the history of a particular population and estimate ethnicity. The Arizona State University Dental Anthropology System (ASUDAS) is designed to allow objective analysis of key morphological features of human dentition. It consists of plaster tiles with a 3D representation of dental features in gradation from minimum to maximum expression. Except for living populations, the method is applicable to fossil hominids and to human skeletal populations. As of 2016, the r-ASUDAS web application is available which enables the classification of individuals into biogeographic groups based on the frequencies of crown and root characteristics. Accuracy ranges from 57 to 92 percent, and the database is updated. The ASUDAS thus becomes applicable in forensic dentistry in ancestry estimation. The workshop will comprise introduction to the ASUDAS system and analysis of the dental crown morphology on dental casts. Participants are kindly requested to bring a dental cast and orthopantomogram of an individual younger than 25 years representing their population.

W6 How to write and publish articles in forensic odontology

Workshop leader/s: Vilma Pinchi, Francesco Pradella & Ilenia Bianchi, University of Florence

Forensic odontology is a vast discipline that extends beyond the core activities of body identification, DVI, dental age estimation and bitemark, to include dental traumas connected with crimes (domestic violence, torture, etc) up to legislation, ethics and medico-legal issues in dentistry. Therefore, the research in forensic odontology can encompass qualitative and quantitative research, experimental or test studies, case reports, but also comments on laws, judge's sentences or ethical issues. A successful publishing of studies is vital for researchers, especially when coming from an academic environment. Very few international journals are exclusively dedicated to forensic odontology, which has indeed a section or is one of the publishing topics in other journals. The main ranking indexes for the most relevant journals that deal with forensic odontology will be discussed. The most critical issues connected with submission, revision and editing processes will be discussed in order to provide some hints to submitters. A preliminary correct selection of the journals possibly interested to publish the research, should steer the article preparing and might represent the key point of the fateful acceptation of the submission. The revision comments should be the best chance to improve researches, but when the process looms extremely hard for both sides, editor/reviewers and authors, the key -question is if it is worth. The success of a published article in indexed journals rests on citations that measure the spreading among the scientific community, hence the title and keywords should be correctly focused.

Invited Lectures I

IL1 Fifty years of IOFOS (1973 – 2023): a historical overview

Author/s: Eddy De Valck
Institution Affiliation/s: European Training Center of Active Forensic Sciences Disaster Victim Identification ETAF-DVI, Neuss; Germany
Presenting author contact e-mail: eddy.de.valck@telenet.be

The Fire of the Bazar de la Charité in Paris on May 4, 1897 may be considered as the real start of the use of forensic odontology. Dr. Oscar Amoedo, a Cuban dentist working in Paris at the time of the fire, is often considered as the father of forensic odontology after publishing his thesis on "L'art dentaire en Médicine légale" as he described in his book the techniques of using teeth and dental records as a reliable source during the identification of the victims of this catastrophe. Since 1968 the Federation Dentaire Internationale (FDI) has taken the initiative of the international promotion of forensic odonto-stomatology. IOFOS was founded as the International Society of Forensic Odonto-Stomatology (ISFOS) at a meeting in Paris in June 1973, Professor Gösta Gustafson from Malmö (Sweden) being nominated as its first President. A complimentary Newsletter was sent out to a number of colleagues, dental schools and others believed to be interested in Forensic Odontology and willing to support the efforts of those promoting FO as a new science by Soren Keiser Nielsen (Denmark), at that time President. Membership was by individuals in that beginning period. After the 1981General Assembly in Bergen membership was changed into Society membership only as the profession became more organized and structured. Also the Society became an Organization and the name changed into IOFOS. IOFOS became stronger as was forensic odontology as a science linking with important world organizations such as FDI, WHO, Interpol, ICRC. Scientific research in forensic odontology, courses and training in forensic odontology at different levels helped our specialism to gain the respect and credibility that it deserves. Today Forensic Odontology is worldwide recognized as one of the reliable forensic sciences

Keywords: IOFOS, forensic odonto-stomatology, history

IL2 Education in forensic odontology - a Brazilian experience

Author/s: Richardo Henrique Alves da Silva
Institution Affiliation/s: School of Dentistry of Ribeirao Preto, University of Sao Paulo, Brazil
Presenting author contact e-mail: ricardohenrique@usp.br

Background: In Brazil, Forensic Odontology is one of the 23 different specialities recognized by the Brazilian Federal Council of Dentistry and, as competencies, the dentists related to the Forensic Odontology work in different fields, such as human identification, DVI, bitemarks, dental damage evaluation, age estimation, ethics in dentistry, civil liability issues, labour expertise exams, crime scene investigation, legal guidance to dentists, and others. Forensic Odontology is a subject present in the majority of Dental Schools in Brazil, and due to this reality, some universities develop activities related to undergraduate and graduate students, from the Dentistry course until the Ph.D. degree. Objective: To present the education experience related to Forensic Odontology at School of Dentistry of Ribeirao Preto (USP - University of Sao 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-known field in Dentistry and universities develop an important role in training a qualified workforce.

Keywords: forensic dentistry, education, university

IL3 Accredited programmes of postgraduate education in forensic odontology

Author/s: Cristiana Palmela Pereira
Institution Affiliation/s: Faculty of Dental Medicine and Faculty of Medicine, University of Lisbon
Presenting author contact e-mail: cpereira@campus.ul.pt

Although each University and Dental School may have different approaches to education and training influenced by structures, cultures and resources, the postgraduate programmes in Forensic Odontology shall follow the same curricular structure in a competence-based curriculum, in order to provide the necessary harmonization of forensic odontology training. The International Organization Forensic Odonto-Stomatology (IOFOS) has as one of its missions the improvement of the quality of forensic odontology practice in Europe and around the world. Within this objective, education and training are key elements and with this presentation, the author aims to formulate some considerations and standards for Graduate Training Programs in Forensic Odontology to graduate students as dental specialists in Forensic Odontology, according to the provisions defined in the European Directive for Professional Qualifications (2005). In order to provide the necessary harmonisation of Forensic Odontology education, every postgraduate education in Forensic Odontology needs to be accredited according to a series of quality standards defined by IOFOS which supply guidelines and common quality standards for graduate training programmes in Forensic Odontology. The first Postgraduate Program in Forensic Odontology in Europe started in 2021-2022. It is an international program between collaboration from University of Lisbon (Faculty of Dental Medicine and Medicine) and from University of Zagreb (Faculty of Dental Medicine). This Postgraduate program is a partial time 1-year program with the curriculum comprises 2 semesters (400 hours per year). This a step for a full-time program based on the guidelines already existent for the other specializations of dental medicine.

Keywords: Posgraduate Education, Accreditation, Curriculum

IL4 Interpol DVI Working Group – a report from the Forensic Odontology Subworking Group

Author/s: Rüdiger Lessig
Institution Affiliation/s: Institute of Legal Medicine, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany
Presenting author contact e-mail: ruediger.lessig@uk-halle.de

The Interpol DVI Working Group (WG) has existed for many decades and is responsible for coordinating major international disaster situations. There are four Subworking Groups (SWG) in total. In addition to the Forensic Odontology Subworking Group, there is a Forensic Pathology SWG, a Forensic Genetic SWG and a Police SWG. In these SWG, the existing standards are primarily reviewed or renewed and adapted to the current innovations. This also includes checking the Interpol forms for AM and PM data collection for the respective SWG. These are available in the PlassData software as electronic input masks.
An intensive review of the standards was started especially after the mission in Thailand after the Tsunami in December 2004, in which more than 30 nations took part. Based on experience, it became apparent that, for example, the Dental Codes needed to be adjusted and reduced. All resolutions made in the SWG are finally transmitted to the DVI WG for updating the DVI Guide.
It has been shown in recent years that the work has ensured that a high standard of quality can be achieved on an international scale and that many countries are actively involved.

Keywords: DVI, mass disaster, identification, interpol

Oral presentations IDENTIFICATION I

01 Salivary protein profile - a tool for forensic identification

Author/s: Archana Muralidharan
Institution Affiliation/s: Manipal College of Dental Sciences Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India
Presenting author contact e-mail: m.archana@manipal.edu

BACKGROUND: In the event of crimes and disasters the personal identification of the unknown still remains a very challenging task. The modern progress in molecular biology has helped different aspects of forensic odontology including salivary proteomics and genomics. The identification of individuals by salivary protein profiling can aid in personalization due to the constant changes observed associated with age throughout life and gender. AIM: To estimate the age and gender-related changes in the saliva by qualitative salivary protein profiling MATERIALS AND METHODS: In this in vivo prospective clinical study, a total of 120 individuals (60 males and 60 females) were included based on specific inclusion and exclusion criteria. The participants were further classified according to their age into 4 groups. In this study nearly 5ml of whole unstimulated saliva was collected in sterile containers and was transferred to tubes coated with EDTA, which acts as a preservative. The saliva samples were centrifuged at -20? following which the supernatants were gently aspirated. The aliquots was preserved at -20 degree Celsius until the time of the assay. The qualitative analysis to determine the salivary proteome was done with SDS PAGE gel electrophoresis. The gels were documented and the qualitative data was interpreted. The data was statistically analysed using Stata Version 17, standard edition (SE) 17 software package. RESULTS: A statistically highly significant difference was observed between age groups for aPRP (30kDa) (p=0.001). A statistically significant difference was observed between age groups for bPRP (44-48 kDa) (p=0.027). No statistically significant difference was observed between age groups for the other protein markers. CONCLUSION: This study establishes age related changes in human salivary proteome and also gives a future potential to construct a salivary proteomic catalogue for age estimation as well as gender determination using saliva.
Sponsorship Acknowledgement:

Keywords: Saliva, forensic dentistry, proteomics, gender

O2 Digital reproducibility of the palate utilizing intraoral scanners and its significance in human identification

Author/s: Akos Mikolicz, Orsolya Gaspar, Botond Simon, Arvin Shahbazi, Janos Vag
Institution Affiliation/s: 1 Department of Restorative Dentistry and Endodontics, Semmelweis University, Budapest, Hungary
Presenting author contact e-mail: mikolicz.akos@gmail.com

Background: Human identification has consistently been challenging due to the scarcity of antemortem data. Intraoral scanners (IOSs) are widely used in dentistry to digitize oral morphology, including the palate. In our prior investigations, monozygotic twins could be discerned by the digital sample of the palate owing to the high repeatability of IOSs. The current study strives to evaluate the influence of various digitization methods and the aging of the subject on reproducibility. Methods: 20 pairs of monozygotic twins (40 individuals) scanned in 2019 by Emerald intraoral scanner (Planmeca) were rescanned in 2021 using Emerald S (Planmeca) with two distinct software versions, Primescan (Dentsply Sirona), and laboratory scanning of a conventional VPS impression (Virtual 380, Ivoclar) and the indirect digitization of a plaster model using a laboratory scanner (PlanScan Lab, Planmeca). The 3D digital palate models were superimposed using the best-fit algorithm to estimate the mean absolute distance (MAD) between surfaces. For repeatability, the scans of the same scanners in the same year; for reproducibility, the scans of different scanners in the same or different years were compared. Results: Compared to the whole palate, the palatal rugae showed significantly more adequate repeatability (21±1µm vs. 34±3µm, $p<0.001$) and reproducibility (87±7µm vs. 114±10µm, $p<0.001$) values. Repeatability was superior to reproducibility for all methods examined ($p<0.001$). There were no significant distinctions among IOSs regarding reproducibility. Indirect digitization has a lower reproducibility than that of IOSs (113±10 µm vs. 70 ±10µm, $p<0.001$). Conclusions: Palatal rugae can be utilized for identification regardless of the IOS brand. Nevertheless, intraoral scanners are more appropriate for this purpose than indirect digitization methods such as conventional elastic impressions or plaster models.

Keywords: identification, rugae, intraoral scanner, twins
Sponsorship Acknowledgement: This research has been funded by the Hungarian Scientific Research Fund (OTKA) and the Hungarian Human Resources Development Operational Program (EFOP))

03 Mobile images in the visualisation of characteristic dental features

Author/s: Vimbai Magagula, Herman Bernitz, Christy Davidson, Paul van Staden, Joyce Jordaan
Institution Affiliation/s: University of Pretoria, South Africa
Presenting author contact e-mail: vimby4@gmail.com

Identification in forensic odontology requires that a known characteristic of an individual's dentition be compared with the same characteristic of the unknown decedent. A vast number of bodies remain unidentified at medico-legal laboratory facilities in South Africa (SA). Determining the extent of this occurrence in SA is important, as these unidentified bodies have many social and economic consequences. When a positive identification has been established, investigations into the circumstances surrounding the death can begin. The positive identification of a body allows for closure to be obtained by that individual's family and friends. In SA a number of factors render forensic identification of unknown individuals challenging. Many South Africans do not have access to modern dentistry, and consequently do not have ante-mortem dental records. In low socioeconomic areas of SA, where individuals might not have access to oral healthcare, studies show that 1 in 3 of those individuals has access to a smart phone. This study aimed at investigating mobile images, hereafter referred to as selfies, as a source of dental information in the form of characteristic dental features. Results of this study were disappointing as identifiable dental features could only be seen in 61 (5.6%) of the collected images (N=1098). The low number of useable selfies collected in this study could be the result of a lack of smiles. Individuals with poor dental aesthetics would commonly choose to take a selfie with a closed mouth where their teeth would not be visible. The most commonly identified dental features included: diastemas (49.2%), dental jewellery (37.7%), crowding (16.4%), difference in tooth height (16.4%) discoloured (8.2%) and missing teeth (8.2%). The importance of good oral health and an aesthetic smile cannot be over emphasised. Awareness of the importance of selfies in forensic identification should be increased.

Keywords: Selfies, identification, record keeping

04 Need for the new dental identification system during ongoing war in Ukraine

Author/s: Yevhen Kostenko - 1, Myroslav Goncharuk-Khomyn - 1, Volodymyr Mishalov - 2
Institution Affiliation/s: 1 Faculty of Dentistry, Uzhhorod National University, 2 National Medical Academy of Post-Graduate Education Named After P.L. Shupik, Ukraine
Presenting author contact e-mail: myroslav.goncharuk-khomyn@uzhnu.edu.ua

Objective: To develop medical information system for forensic dental identification of the military personnel and persons injured due to the ongoing war conditions in Ukraine.
Methods: Cases from forensic medical bureaus were collected to analyze relevant problems of providing effective identification for war victims in Ukraine. Development of comprehensive approach was based on processing digital dental radiography results, while also on processing the data of intraoral volumetric scanning in order to verify unique features of the dental status. Final design of developed approach was formulated in the format of medical information program for forensic dental identification with the possibility of its further practical implementation into the complex identification protocol of military personnel and persons injured due to the war actions.
Results: Developed medical information program for dental identification supports partial automatization of the identification processes, which reduces the number of required expert hours in 0.4-0.6 times depending on the complexity of various practical cases. Functioning of the medical information program for the identification of military personnel and persons injured during military operations requires the use of modern portable diagnostic dental devices, including mobile X-ray machine and an intraoral scanner, instead of bulky and expensive laboratory equipment. Such approach increases the mobility of the identification process and allows it to be stratified into several stages with the possibility of involving specialists of different qualification categories.
Conclusion: Ongoing war in Ukraine arguments the need for the new expert forensic dental identification approaches development, which should be characterized with sufficient portability, mobility, efficiency and validity. The implementation of dental status digital analysis tools into the identification algorithms will contribute to the reduction of necessary expert-hours, minimize the need of using expensive laboratory equipment, and increase identification process mobility.

Keywords: dental identification, Ukraine, digital approach, war conditions
Sponsorship Acknowledgement: Authors report no conflict of interest, and the article was not funded or supported by any research grant.

05 Effectiveness of digital dentistry advances for the forensic odontology practice

Author/s: Myroslav Goncharuk-Khomyn, Wayne Hirschowitz
Institution Affiliation: Faculty of Dentistry, Uzhhorod National University, Digital Dentistry Society, Ukraine
Presenting author contact e-mail: myroslav.goncharuk-khomyn@uzhnu.edu.ua

Objective: To analyze expediency of various image superimposition protocols and approaches assisted with artificial intelligence-based (AI) detection algorithm for the conformity of 3D objects similarities during comparative dental identification; objectify perspective of using above-mentioned digital analysis tools for potential graphical reconstruction of absent jawbone fragments. Methods: Study sample was formed out of 70 3D graphical objects of jawbone areas, originally obtained after CBCT procedures. CBCT-derived *.dcm files were converted into *.stl files using specific image conversion and processing protocols. Received graphical files were intentionally altered through various segmentation algorithms with different level of segmentation variability. Segmented 3D stl-objects undergone graphical superimposition, while *.dcm files were superimposed using algorithms for image similarities detection targeted at clusterization of pre-specified regions of interest and their further fractal differentiation. Results: Graphical disintegration of 3D jawbone objects that outreach 47% of segmentation variability was interpreted as crucial regarding odd ratio to obtain appropriate level of image conformities during comparative identification of stl-files. AI-based algorithms for image similarities detection targeted at clusterization of pre-specified regions of interest and their further fractal differentiation supported more efficient outcomes of comparative identification both in integral and deformed conditions of analyzed 3D jawbone objects, which outreach efficacy of nurb-to-nurb ($p<0.05$), line-to-line ($p<0.05$) and node-to-node ($p<0.05$) superimposition protocols. Graphical superimposition methods and AI-based detection algorithm for the conformity of 3D objects have not benefited for the additional positive outcomes of lost jawbone fragments reconstruction within the experimental conditions. Conclusion: Forensic odontology may benefit from using modern digital dentistry approaches targeted at 3D stl-object superimposition during comparative identification. Usage of images similarities detection algorithms based on clusterization of pre-specified regions of interest and their further fractal differentiation could optimize forensic identification process and serve for war victims identification in Ukraine.

Keywords: dental identification, fractal analysis, AI-based algorithm, digital dentistry
Sponsorship Acknowledgement: Authors report no conflict of interest, and the article was not funded or supported by any research grant.

06 Investigating the influence of sex and ethnicity on human identification using palatal scans

Author/s: Botond Simon -1, Aida Roudgari -1,2 , Akos Mikolicz -1, Arvin Shahbazi 1-3, Janos Vag -1
Institution Affiliation/s: 1Department of Restorative Dentistry and Endodontics, 2 Department of Anatomy, Histology and Embryology (Oral Morphology Group), 3 Department of Periodontology, Semmelweis University, Budapest, Hungary
Presenting author contact e-mail: dr.simon.botond@gmail.com

Objective: Palatal scans offer a non-invasive and reliable method of identifying individuals based on the unique features of their palatal rugae. With the development of advanced digital technologies and image processing techniques, the superimposition of palatal scans has become a promising method for forensic investigations. In this study, we investigate the effect of sex and ethnicity on palatal scan-based human identification. The objective of this research is to examine how sex and ethnicity influence the ability to differentiate between individuals using superimposition-based techniques through intraoral scanning. Method: A total of 23 participants (16 females and seven males, aged 23-35) from 11 Asian and European countries were included in this study. Three scans were obtained from each participant using an Emerald intraoral scanner. The distances between countries were determined using longitude and latitude. The repeatability of the scans was assessed by aligning the scan replicates of the same subjects, and the differences between subjects were assessed by aligning the scans of different individuals. The mean absolute differences (MAD) between the aligned scans were calculated and compared to evaluate the discrimination potential. Furthermore, the effect of sex and ethnicity on the MAD was examined by performing multiple linear regression analysis of MAD. Results: There were distinct differences between the lowest value of the between-subject MAD (0.214 mm) and the highest value of repeatability (0.093 mm). The results showed that neither sex ($rP=-0.06$, $p=0.343$) nor latitude ($rP=-0.12$, $p=0.058$) had an effect on MAD, while the longitude had a weak negative effect on MAD ($rP=-0.16$, $p<0.01$). Conclusion: The findings of the study demonstrate the reliability of palatal scanning as a forensic identification technique, even in populations of mixed ethnicities. Nonetheless, the superimposition method may not be capable of accurately determining sex and ethnicity.

Keywords: human identification, superimposition, ethnicity
Sponsorship Acknowledgement: The study was supported by different funds including Hungarian Scientific Research Fund (OTKA), Hungarian Human Resources Development Operational Program (EFOP), UNKP-New National Excellence Program of the Ministry for Culture and Innovation, and the Semmelweis Excellence Scholarship Program.

07 Forensic inspection of palate deterioration in animal models based on morphological and digital aspects

Author/s: Arvin Shahbazi 1-4, Sandor Miko 1, Janos Vag 1
Institution Affiliation/s: 1 Department of Restorative Dentistry and Endodontics, Semmelweis University, 2 Department of Anatomy, Histology and Embryology (Oral Morphology Group), Semmelweis University, 3 Department of Periodontology, Semmelweis University, 4 Disaster Victim Identification (DVI) Hungary, Forensic Dental Unit, Budapest, Hungary
Presenting author contact e-mail: arwin_shahbazi@hotmail.com

Background: Distinct patterns of palatal rugae play an essential role in forensic investigation. By utilizing intraoral scanners (IOS), factual aspects of the palatal rugae can be documented and compared digitally. However, supplementary deconstructions are required to apprehend the postmortem deterioration patterns of the palate. Objectives: The current investigation analyzed the palate's decomposition morphologically in animal models. Second, the aim was to measure decomposition's effect on IOS repeatability. Methods: Ten fresh lamb palates were incubated for 20 days (21° C; 80% humidity). The specimens were photographed and scanned thrice daily with an Emerald S IOS (Planmeca). The blood and impurities were not washed in the first five specimens; nevertheless, the area was thoroughly cleansed in the second 5 series. The morphological aspects of the palates were compared day by day. The three repeated scans were compared with each other by best-fit alignment. The mean absolute distance (MAD) between aligned surfaces was calculated to assess the repeatability. Results: Morphologically, the palates' central aspects commenced darkening about day 6; however, the position of the rugae was roughly in contact. Around day 12, the rugae dimension appeared to shrink, and the lateral aspects of the palate were resorbed. By day 20, the surfaces of the palates were decomposed, and the morphological patterns of the rugae were altered. The change in MAD values was plotted in relation to days. The precision was significantly ($p<0.001$) lower in the first group (median, 0.025 mm; range 0.006-0.127 mm) than in the second group (median, 0.013 mm, range 0.007-0.172). The time of decay did not significantly affect the precision in either group. Conclusions: The animal model is a forthright instance to investigate palatal decay. The IOS could capture the decayed lamb palate with high precision. In washed specimens, the precision can be improved.

Keywords: Forensics, Palate, Intraoral scanner, Morphology
Sponsorship Acknowledgement: Hungarian Scientific Research Fund, Hungarian Human Resources Development Operational Program (EFOP)

08 Analysis of enamel peptides: assessing the applicability of a new method of sex estimation in forensic analysis of human skeletal remains

Author/s: Iztok Štamfelj - 1, 2, Robert Vidmar - 3, Marko Fonović - 3
Institution Affiliation/s: 1 Department of Dental Diseases and Dental Morphology, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, 2 Department of Operative Dentistry and Endodontics, University Medical Centre Ljubljana, Ljubljana, Slovenia, 3 Department of Biochemistry, Molecular and Structural Biology, Jozef Stefan Institute, Ljubljana, Slovenia
Presenting author contact e-mail: iztok.stamfelj@mf.uni-lj.si

Objective: Sex assignment in forensic and anthropological analyses of human skeletal remains depends mainly on the sexually dimorphic morphological characteristics of the skeleton and on the analysis of molecular markers on the sex chromosomes. Recent advances in proteome analysis of the enamel using mass spectrometry have made it possible to determine the sex based on the identification of sexually dimorphic peptides of amelogenin. The aim of this research was to: (i) test the method on modern teeth; (ii) evaluate its potential usefulness for forensic investigations based on the results and literature review. Methods: We used a cohort of 14 permanent teeth extracted during dental treatment in seven male and seven female patients. The tooth type, patient's age, and sex were recorded by the treating dentists after obtaining written consent. Every tooth was coded and analysed blind. The samples were prepared using an optimized version of the protocol of Stewart et al. (2017), as described by Ziganshin et al. (2020). The peptides were extracted by surface acid etching of enamel and subsequently analysed by liquid chromatography and tandem mass spectrometry (LC-MS/MS). The PEAKS software package (Bioinformatics Solutions, USA) and the nrNCBI human protein database were used to identify the peptides. Sex estimation was based on the identification of the peptide pairs AMELX-(44-50) (SIRPPYP) and AMELY-(58-65) (SMIRPPYS). Results and Conclusions: The proteomic fingerprint matched data on the patient's sex in all cases. The literature review shows that the well-known PCR-based amelogenin sex test and its recently developed proteomic counterpart share a common weakness of assigning the female sex to males carrying AMELY deletion. Considering this drawback, it is currently the most sensitive sex estimation method that can be applied to human skeletal remains and thus particularly useful if genetic sex markers are insufficiently preserved.

Keywords: sex assessment, enamel, amelogenin, LC-MS MS

Oral presentations IDENTIFICATION II

09 Post Mortem Interval (PMI) estimation method using RNA degradation pattern and gene expression in human dental pulp under varied time intervals

Author/s: Shalini Gupta
Institution Affiliation/s: Departmet of Oral Pathology and Microbiology, King George's Medical University, Lucknow, India
Presenting author contact e-mail: sgmds2002@yahoo.co.in

Objective: In the present study, we will analyze the RNA degradation pattern and gene expression (HIF1α, GAPDH, β-Actin) under various time interval to estimate the PMI from the dental pulp tissue.
Methodology: The tooth samples will be exposed to different time intervals i.e.1, 3, 5,10, 30, 180 and 365 days at room temperature. Tooth pulp will be extracted by longitudinally sectioning through the medial axis by a dental drill equipped with diamond bur at 15000 rpm with water cooling using micro-motor and RNA Degradation pattern will be analyzed by Bioanalyzer 2100. In addition, gene expression will be further analyzed using Real time-PCR.
Results: The results of RNA Degradation show us a degradation pattern. However, the results of 180 days and 1 year RIN was found below 2 therefore were considered degraded and was not found suitable for further experimentation. Similarly in the gene expression analysis using qRT-PCR different genes HIF1α, GAPDH, β-Actin are showing a pattern of expression in the terms of fold change as compared to control.
Conclusion: According to the results of the study, we have found a pattern that is providing a basis to develop bigger statistical grid with wide range of time intervals.

Keywords: molecular approach, dental pulp, PMI estimation, RNA degradation, HIF-1, RIN, qRT-PCR

010 Workflow of a multi-institution collaboration for anthropology and forensic facial reconstruction of unknown skeletons in Brazil

Author/s: Thiago L Beaini-1, Janina P Curi-2, Leticia V Santos-3, Carla R Machado-4, Sergio V Cardoso-1, Rodolfo F H Melani-5
Institution Affiliation/s: 1 Federal University of Uberlandia Dental School -MG, Brazil, 2 Unitri Dental School -MG, Brazil 3 University of Sao Paulo Dental School, Brazil, 4 Federal University of Uberlandia Dental School, -MG, Brazil 5 University of Sao Paulo Dental School, Brazil
Presenting author contact e-mail: tbeaini@gmail.com

The "development of imaging methods in the search for missing people" project, financed by CAPES (Brazil), has the three-dimensional digital forensic facial reconstruction (3DFFR) of unknown skulls within its goals. With unique methods and scale, it established a remote workflow connecting Legal Medicine institutes (LMI) in 4 states and two universities. It includes case studies and the search for 3DFFR parameters. This work aims to describe the workflow for 3DFFR in a multi-institution project and its advancements after two years. Initially, at the LMI the anthropological analysis is made, determining sex and estimating the age. Linear measurements, including Nasion-Prosthion and bi-zygomatic distances, are in the report. The 3D process uses 35 standardized pictures taken from 2 angles around the skull and transferred to the University of Sao Paulo. There, 3D models are built by photogrammetry using Metashape®. In Blender® with the addon ForensicOnBlender, at the Federal University of Uberlandia, it is scaled based on previous measurements. Prefabricated soft-tissues markers and references for the eyes, nose, ears, and mouth are imported into the file. Those references were established by seven ethically approved research, related to this project. A facial model is prepared in MakeHuman® and adjusted onto the skull with the markers. Exported to UnrealEngine®, the modeled faces are transformed into Metahuman® format. This online tool can characterize it based on the anthropology report and can animate it, simulating movement and expressions. To our knowledge, this project used this advancement for the first time for this purpose. To the public, 3DFFRs are presented as grayscale videos and images, with location and personal belongings information. In its two years, the project fomented seven research whose parameters guided 12 3DFFRs in three states. An estimation of 50 more should be made by this project. So far, one possible identification is under analysis.

Keywords: forensic, facial approximation, identification
Sponsorship Acknowledgement: This study was financed in part by the Coordenacao de Aperfeicoamento de Pessoal de Nivel Superior, Brasil (CAPES) Finance Code 001

011 Exploring the handling of tooth remains in human identification

Author/s: Chinmaya Subudhi, Ademir Franco, Scheila Manica
Institution Affiliation/s: University Of Dundee, UK
Presenting author contact e-mail: Csubudhi12@gmail.com

Forensic odontology surged around the 1880s and is a rapidly expanding branch of forensic science. When an individual's presumptive identification is unknown and antemortem data are unavailable, post-mortem dental profiling is used. When skeletal remains are extensively degraded in places unconnected to their place of origin, such occurrences are relatively uncommon. During the recovery phase of the Disaster Victim Identification (DVI) process, it is critical to conduct a comprehensive search of the site and identify, document, photograph, collect, and label any body parts. Objective-This study aimed to investigate the protocols of 1) dental charting, 2) dental photography, and 3) dental radiography of the tooth remains by an integrative literature review of all three components. Methods-An electronic search was carried out using six databases, i.e., "Scopus", "Science Direct", "PubMed/MEDLINE", "Lilacs", "Cochrane", and "SciELO", using Boolean Search Strategy having command connecting keywords. And the five associations were also reviewed, namely the British Association of Forensic Odontology (BAFO), the International Organization for Forensic Odonto-Stomatology (IOFOS), American Board of Forensic Odontology (ABFO), The Australian Society of Forensic Odontology (AuSFO), Interpol Disaster Victim Identification (DVI) Guide. The Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) guidelines were used to review articles. Results-The academic search performed in the English language resulted in 3496 articles from the electronic databases, but only three met the criteria. Conclusion-According to the associations and organisations recognised globally, no guidelines presented information on charting, photography, or radiography of fragmented tooth remains. Therefore, a tool for the segregation of tooth fragments such as a separation tray for human identification is recommended in this study.

Keywords: charting, photographs, identification, tooth fragment

012 Forensic odontology identification approach without dental records

Author/s: Khalid Khalid 1,2
Institution Affiliation/s: 1 Department of Forensic Odontology, School of Dentistry, Nabta College, Sudan 2 PHD Student, School of Dental Medicine, University of Zagreb
Presenting author contact e-mail: drkhalidonline@yahoo.com

The identification of unknown bodies is one of the major rights of deceased during disasters. The identification of carbonized, mutilated, skeletonized or decomposed bodies is most probably by the analysis of dental characteristics through comparing the postmortem data with antemortem information collected from their dental records. However, particularly in the third world countries, most of the clinics have no dental records system. This was a challenge as big accidents, wars and armed conflicts always happened in these countries. Identification of victims especially those who could not be identified by fingerprints is a big problem due to lack of dental records and high cost of DNA tests. In Sudan, we have a long history of wars, armed conflicts and missing persons list which always increased. Lack of dental records system and shortage of budget for DNA tests present challenge for identification. As identification by using social media photos & smile analysis had found some acceptance, we approach new guidelines to be used for identification of unknown individual in Sudan. In this work, we will discuss our methodology for this approach presenting more than six cases of unknown bodies who had been identified and received by their families. Using of specific unique dental features of the deceased supported by belongings, clothes and other special findings if any was very helpful to confirm identity.

Keywords: dental identification, selfie, smile, photos

013 A pilot study on post-mortem determination of drug abuse on dental tissues

Author/s: Ilenia Bianchi -1,2, Marta Cippitelli -1, Erika Buratti -1, Vilma Pinchi -2, Mariano Cingolani -1
Institution Affiliation/s: 1 Forensic Medicine Laboratory, Institute of Legal Medicine, University of Macerata, Italy, 2 Forensic Medical Sciences, Department of Health Science, University of Florence, Florence, Italy
Presenting author contact e-mail: ilenia.bianchi@unifi.it

Post-mortem toxicology constantly deals with the research of reliable alternative matrices for forensic purposes in conditions in which the recovered corpses are highly decomposed or destroyed and usual matrices are not available (charred, skeletonized, or exhumed bodies). Teeth can be used as an alternative matrix since their high resistance and the unique retrospective window of drugs assumption they could provide. This study presents an experimental method for separately analyzing the different dental tissues (enamel, dentin, and pulp) with the aim of determining whether the substances detected in blood vessels of pulp reflect circulation in the acute phase of death and whether the substances deposited in dentine and enamel denote a history of drug of abuse. A total of 10 teeth were collected during autopsies of drug-related deaths along with blood and hair samples for classic analyses. Each tooth was prepared for toxicological analysis with a dental unit from the same operator using measured diamond and multi-blade burs on a turbine above an amalgam aspirator coated with filter paper. Teeth were divided into two longitudinal halves and pulp was extracted from the chamber and roots. The enamel was pulverized and separated from the coronal dentin. The coronal secondary dentin was separated from the primary dentin pulverizing an inner layer of approximately 1,5 mm coronal and 1 mm cervical thickness. The residual outer coronal dentin was pulverized and separated from the roots. Each dental tissue was extracted with acid for cocaine, opiates, and metabolites and analyzed by gas chromatography (GC) and liquid chromatography with high resolution mass spectrometry (HR-MS). The results were then compared with those obtained from blood and hair. Preliminary results demonstrated a qualitative correlation in detecting substances between pulp/blood and dental hard tissues/hair, suggesting that teeth can be a useful post-mortem matrix for both acute and chronic assumptions.

Keywords: forensic toxicology, teeth, GC-MS, UHPLC HR-MS

014 Post-mortem mutations in dental DNA as a measure for Post-Mortem Interval (PMI)

Author/s: Ilenia Bianchi -1, Francesco Pradella -1, Veronica Pennati -2, Irene Migliastro -2, Francesca Castiglione -2, Vilma Pinchi -1
Institution Affiliation/s: 1 Forensic Medical Sciences, Department of Health Science, University of Florence, Florence, Italy, 2 Section of Anatomic Pathology, Department of Health Sciences, University of Florence, Florence, Italy
Presenting author contact e-mail: francesco.pradella@unifi.it

In a previous pilot study, the authors developed a new method for post-mortem interval (PMI) estimation based on the analysis of post-mortem dental DNA with the Next-Generation Sequencing technique (NGS). Preliminary results highlighted the occurrence of post-mortem mutations in the DNA of dental pulps from extracted teeth (time of death) in relation to the time elapsed since death (PMI), suggesting a promising data source for early and late PMIs estimation (from 0 to 34 days) for forensic purposes. The aim of this study is to validate the innovative method developed by analyzing teeth from the same subjects at different post-mortal intervals. A total of 10 vital and intact teeth were extracted from 4 different healthy patients for clinical reasons (e.g. periodontal disease, orthodontics) to have certain PMIs. Samples were stored at room temperature and monitored by a data logger (IButton DS1923 Hygrochron) which constantly recorded temperature and humidity until the moment of pulp extraction to correlate the registered PMIs to the corresponding Accumulated Degrees days (ADD). The PMI was considered as the time elapsed since dental avulsion that caused interruption of the blood supply and induction of cell necrosis (comparable to the death of the subject) up to the pulp extraction for genetic analysis. Pulp extraction from each tooth belonging to the same subject was performed both in succession to different PMIs/ADDs to verify that the occurrence of mutations was related to post-mortem necrosis and not to pre-existing pulp alterations, and to the same PMI/ADD to verify the correspondence of the mutations detected in multiple samples. A multigene panel validated for the detection of somatic variants due to oncological pathologies was applied to the sample for the NGS Analysis. The results obtained will implement the innovative research line for PMI estimation using the NGS technique on post-mortem dental DNA.

Keywords: dental DNA, NGS, PMI, mutations

015 The use of medical imaging and 3D methods in the identification of human remains from the mass graves on the grounds of the former Poznan NKVD camp

Author/s: Dorota Lorkiewicz-Muszynska-1,3, Jan Jagiello-2, Agata Wasewicz-Madejek-2, Julia Sobol-3, Jedrzej Oberc-1, Marzena Labecka-4, Grzegorz Teresinski-5, Agnieszka Cugier-6, Mariusz Glapinski-7, Pawel Swiderski-1, Damian Rusek-1

Institution Affiliation/s: 1 Department of Forensic Medicine, Poznan University of Medical Sciences, 2 Institute of National Remembrance, The Office of Search and Identification, Warsaw, 3 Department of Forensic Medicine, Collegium Medicum, University of Zielona Gora, 4 Department of Forensic Medicine, Pomeranian Medical University in Szczecin, 5 Department of Forensic Medicine, Medical University of Lublin, 6 Department for Uniformed Services, National Health Found, Warsaw, 7 Department of Anatomy, Poznan University of Medical Sciences, Poland

Presenting author contact e-mail: dlorkiew@ump.edu.pl

Objective: With the help of comprehensive forensic medical, anthropological, odontological, X-ray and CT examinations interdisciplinary team aim to reveal material and unique features which can be used for the identification of human remains revealed during the exhumation of communist regime victims by the Institute of National Remembrance on the premises of the former Speclagier NKVD camp No. 2 in Poznań. Materials and methods: Forty-four pits located in three rows were explored during two archaeological seasons in 2017 and in 2018. 15 tombs, containing 44 complete and fragmented skeletons were discovered. The human remains were subjected to anthropological, odontological, and forensic analyses. Additionally, X-rays were performed using Agfa model DX-D-100 mobile digital X-ray machine. Ten skulls and one skeleton were chosen to be scanned by means of the 16-row Toshiba Astelion Advance Edition CT scanner. The 3D facial approximation and in one case the 3D whole body of victims were reconstructed. Results: The research reveals that the excavated human remains belonged to 44 male subjects, comprising 43 adults and one adolescent of about 17-18 years. The remains of two individuals showed injuries caused intentionally by the application of great force to both the skull and the non-cranial skeletal bone. Numerous changes resulting from chronic inflammation, such as bone fusions and degenerative processes, antemortem healed trauma were observed in the remains. One case of ankylosing spondylitis and one case of Klippel-Feil syndrome were disclosed. Conclusions: It was important to reveal rare diseases, such as Klippel-Feil syndrome, ankylosing spondylitis, post-traumatic change, resulting in the physical characteristics of the body and behavior of people. Correct and thorough diagnosis of pathology, 3D visualization of individual features may prove useful at the stage of searching for families and can lead to the collection of DNA for comparison research.

Keywords: NKVD camps, mass graves, identificatication

Oral presentations EDUCATION IN FORENSIC ODONTOLOGY

016 Becoming a forensic dentist - a discussion on the teaching-learning process

Author/s: Scheila Manica
Institution Affiliation/s: University of Dundee, Dundee, United Kingdom
Presenting author contact e-mail: s.manica@dundee.ac.uk

Objective: This observational investigation aimed to explore the pedagogic structure of Forensic odontology academic programmes at the University of Dundee, United Kingdom. Method: Evaluations of module feedbacks from 50 anonymized international students enrolled in both 'MSc in Forensic Dentistry' and 'MFOdont Forensic Odontology' programmes were collected over six years (2016-2022). Reports from three external examiners were also considered. Results were qualitatively analyzed according to level of satisfaction and commentaries. Results: Students from different backgrounds have high educational and occupational aspirations that might be confronted with the heterogeneous labor markets in the world. Most students valued the exposure to practical sessions, especially human identification in the mortuary. A few students are not interested in research or have great difficult to write reports. Also, the chronological age is a factor to be considered in the different teaching modes, especially when using digital teaching tools or digital interactive exercises. Sessions on Psychology were added to the programmes due to demand. Conclusion: teaching staff might face challenges when dealing with the lack of international or local standard operational protocols, principles or guidelines to teach the topic. Nevertheless, the constant critical appraisal of the academic content and incremental experience in teaching tend to improve the quality of programmes and increase student satisfaction.

Keywords: forensic odontology, teaching, learning, quality

017 Forensic odontology guidelines: a scoping review

Author/s: Cezar Capitaneanu - 1, Anca Iliescu - 2, Ioana Maris - 3, Gabriel Fonseca - 1
Institution Affiliation/s: 1 Research Center on Forensic and Legal Odontology, Faculty of Dentistry, University of La Frontera, Temuco, Chile, 2 Bestsmile Sion, Sion, Switzerland, 3 Department of Paediatrics and Child Health, University College Cork, Cork, Ireland
Presenting author contact e-mail: capitaneanucezar@yahoo.co.uk

Objective: This study aimed to review the literature related to existing guidelines in forensic odontology and their accessibility in peer-reviewed publications. Methods: An electronic search until 2023 was performed using 6 databases - Medline/PubMed, Scopus, SciELO, Cochrane, OpenGrey, and Guidelines International Network (GIN) using the relevant terms. The search was supplemented by access of existing websites of the main forensic stakeholders and law enforcement agencies (IOFOS, ABFO, AAFS, INTERPOL, and NATO). Results and Conclusions: A number of 226 studies were reviewed. Out of these, 214 were detected through the electronic search string and 12 were sourced from websites. Only 15 studies were considered eligible after review of title, abstract and full text. Three (20%) were published in peer-reviewed journals, referring to age estimation (n=1), body identification (n=1), and photography of marks and injuries (n=1). Twelve (80%) were published on organizational websites referring to body identification (n=3), age estimation (n=2), bitemarks (n=2), DVI (n=3), dental injuries (n=1), and forensic odontology report (n=1). The demand for publications on forensic odontology guidelines in peer-reviewed journals needs to be considered in terms of current requirements of evidence-based science, as well as enhancing accessibility and visibility.

Keywords: Forensic Odontology, Guidelines, Standards
Sponsorship Acknowledgement: The authors have nothing to disclose.

O18 The evolution of forensic odontology education in Indonesia

Author/s: Nurtami Soedarsono-1, Masniari Novita-2, Mindya Yuniastuti-1, Elza I. Auerkari-1
Institution Affiliation/s: 1 Department of Oral Biology, Division of Forensic Odontology, Faculty of Dentistry, Universitas Indonesia, 2 Biomedical Department, Faculty of Dentistry, University of Jember, Indonesia
Presenting author contact e-mail: drtamy@gmail.com

Indonesia has experienced several major disasters and significant crimes, which leads to the need for well-trained forensic odontologists. Until 2023, forensic odontology courses have been given in the undergraduate, master's, specialist's, and dental profession programs. The Indonesian Faculty of Dentistry Association and the Indonesian Medical (Dental) Council are responsible for the standard of education and qualification. At the same time, the Indonesian Society of Forensic Odontology and the Indonesian College of Forensic Odontology are accountable for professional development. This study aims to describe the forensic odontology courses in Indonesia as models for providing a fundamental education and basic skills in forensic odontology. Students are provided with a suitable curriculum according to the degree levels and the practice skills, disaster preparedness management, educational insights for further forensic odontology education, and an opportunity to be involved in national/international forensic activities.

Keywords: forensic odontology, education, Indonesia

019 Perception regarding forensic odontology among the undergraduate students of northern India

Author/s: Harmanpreet Kaur- 1, Ridhi Narang- 2
Institution Affiliation/s: 1 Adesh Institute of Dental Sciences and Research, Bathinda, India, 2 Department of Public Health and Community Dentistry, Adesh Institute of Dental Sciences and Research, Bathinda, India
Presenting author contact e-mail: harmanpreetbrar1996@gmail.com

Abstract Objective: Forensic odontology is a proliferating unit within the domain of forensic sciences that involves the application of dental knowledge in the identification of deceased individuals through dental records. The objective of the present study was to assess the awareness of Forensic Odontology among the undergraduates of various dental colleges located in Punjab state. Materials and Methods: Nearly 500 participants took an interest in this cross-sectional study and filled out a structured e-questionnaire disseminated amongst them through whatsapp. The data was further analyzed through SPSS software and was plotted on a graph. Results: The result varied among the students, where around 62% knew about the importance of forensic odontology. An increased proportion of students had some understanding and awareness of forensic odontology in dentistry, but they lacked in the field of its applicant knowledge. Conclusion: This field, flourishing to heights abroad, was still reported to be at an infant stage in India due to the lack of proper awareness and probably not encouraged as much as the other clinical fields in dentistry.

Keywords: dental students, forensic odontology, identified

O20 Correlation between forensic odontology knowledge and the interest as forensic odontologists

Author/s: Masniari Novita-1, Kumara Pandya Fahar Aptanta- 2, Dwi Kartika Apriyono- 1
Institution Affiliation/s: 1 Biomedical Department, Faculty of Dentistry, University of Jember, 2 Dental Profession, Faculty of Dentistry, University of Jember, Indonesia
Presenting author contact e-mail: masniari@unej.ac.id

Background: There is an urgent need for more forensic odontologists due to Indonesia's high number of disasters. Lack of interest and awareness of the role of forensic odontology is one of the reasons there is a shortage of personnel in this area of dentistry. **Objective:** The purpose of this study was to identify and analyze the relationship between the knowledge and the interest in forensic odontology specialist education of dental profession students in Indonesia. **Method:** Correlational analytic survey with a cross sectional study was used in this research. Total of 259 dental profession students, 217 females and 42 males included in this research were from 5 region university in Indonesia. The respondents fulfill the questionnaire about their knowledge and interest in forensic odontology. **Results:** The result showed that 137 respondents (53%) showed a good knowledge and high level of interest forensic odontology. **Conclusion:** The knowledge of the role of forensic odontology in dental profession students were good. There was a correlation between forensic odontology knowledge and the interest to continue to the specialist education in forensic odontology.

Keywords: forensic odontology, knowledge, interest

021 Transmission of knowledge from an experienced forensic odontologist to the new beginner

Author/s: Silje Arnet Evje - 1, Sigrid I. Kvaal - 2
Institution Affiliation/s: 1 General Dental Practice, Lunner, Norway; 2 Dental Faculty, University of Oslo, Norway
Presenting author contact e-mail: s.i.kvaal@odont.uio.no

This presentation will be a dialog between a dentist inexperienced in forensic odontology asking questions and the experienced forensic odontologist trying to answer. Questions that will be raised include what type of manner of death presents the biggest challenge for a forensic odontologist? What type of facial injuries are found in high-speed accidents? How quickly does a body degrade? What is the success rate in identifying foreign nationals? What identification criteria is most common in Norway? What is the greatest challenge to forensic odontology in Norway? There are generally no straight forward answers to such questions and the experienced forensic odontologist must answer from experience. Badly burnt bodies and crushed jaws are difficult to register for PM examination. The body degradation depends on the temperature, humidity, and soil. The Norwegian DVI group follows the regulations from Interpol, but a great challenge is to get dental records of victims.

Keywords: forensic odontology, DVI, PM examination

Oral presentations MEDICO-LEGAL FIELD

O22 Medicolegal risk management of dental injuries during orotracheal intubation by the new custom-made dental protective splint

Author/s: Emilio Nuzzolese -1, Giulio Rosboch -2, Davide Santovito -3, Francesco Lupariello -1, Giancarlo Di Vella -1
Institution Affiliation/s: 1 Section of Forensic Medicine, DSSPP, University of Turin, 2 Anesthesia, Resuscitation and Emergency Department, Hospital Citta' della Salute e della Scienza, 3 Legal Medicine Unit, Hospital Citta' della Salute e della Scienza, Turin, Italy
Presenting author contact e-mail: emilio.nuzzolese@unito.it

Objective: General anesthesia requires endotracheal intubation which can cause dental lesions in some patients, especially in complex cases or in patients with dental vulnerabilities. The teeth most affected are the upper incisors and the main injuries are represented by fractures, subluxations, avulsions, enamel injuries, crown fractures, and root fractures. Dental damages can be reduced by using a dental protective device. A new custom-made dental splint with different thicknesses was designed to allow greater ease in the maneuvering of the anesthesiologist and mitigate dental damage risks. Methods: 24 patients with dental damages after orotracheal intubation in the period 2011-2020 were selected from Hospital Citta della Salute e della Scienza of Turin, Italy, to evaluate breach and causation as well as their oral condition. An anonymous questionnaire was also delivered to 21 anesthesiologists working in the same hospital, to evaluate the use of a standard dental protective device. An innovative custom-made dental splint was designed using an intraoral scanner and a 3D-printed splint with thicknesses ranging from 0.5 to 2.5 mm. Results: Teeth most involved in the lesions were central and lateral upper incisors 87.5%; lower incisors 12.5%; lower canine 4.1%. Anesthesiologists interviewed confirmed either sporadic use, or even the misuse of dental protective devices in 61,9% of the cases. Anesthesiologists interviewed reported in 66,67% they would use a thinner dental protective splint, if available. Conclusion: The misuse of a protective dental device is a contributing factor to dental damages and medicolegal claims. The new custom-made 3D printed dental protective splint (patent IT-202023000000291) proposed is a useful risk management tool that can mitigate or eliminate the risk of dental damage as the different thicknesses of this device will allow a wider use by anesthesiologists.

Keywords: endotracheal intubation, claims, dental splint

023 War crime investigation

Author/s: Svend Richter
Institution Affiliation/s: University of Iceland, Faulty of Odontology, Reykjavik, Iceland
Presenting author contact e-mail: svend@hi.is

In light of the ongoing war in Ukraine, the aim is to examine how war crimes have been investigated so far, which international laws apply to war crimes, and how forensic odontology is involved. Criminal investigations include an autopsy with a focus on the cause of death and evidence preservation. The identification of the victim is included. Sources on war crimes were explored, particularly the war crimes tribunals approved by the UN in The Hague. Attention was paid to what has been done to investigate war crimes in Ukraine so far. The International Criminal Court, ICC, opened an investigation into potential war crimes, crimes against humanity in Ukraine on March 2022. A year later ICC issued warrants of arrest for two Russian individuals. A war criminal is a person who has carried out an act during the conduct of a war that violates accepted international rules of war. It is a problem that Russia is not a member nation of the ICC, which does not have jurisdiction in Russia. Ukrainians propose to appoint a special war crimes tribunal for the war in Ukraine. The Interpol DVI unit is in close contact with the Office of Prosecutor at the ICC to discuss a potential coordinated DVI response, such as coordination amongst member country's DVI units, the provision of Interpol DVI standards, provision of possible AM data of missing foreigners and participation in Reconciliation and ID Board. It will be difficult to investigate war crimes in Ukraine through criminal investigation of victims while the war is still going on.

Keywords: war crime investigation, forensic odontology, ICC

024 Orofacial injuries identified in the medicolegal autopsy- a case report - WITHDRAWN

Author/s: Gabriel M. Fonseca
Institution Affiliation/s: Centro de Investigacion en Odontologia Legal y Forense (CIO), Faculty of Dentistry, Universidad de La Frontera, Temuco, Chile
Presenting author contact e-mail: gabriel.fonseca@ufrontera.cl

025 Prevalence of bodily injuries in women assisted by scientific police in relation to Covid-19 pandemic

Author/s: Larissa Barros Costa- 1,2 Luiz Fernando Lolli- 2
Institution Affiliation/s: 1 Scientific Police of Paraná State in Brazil, 2 University of Maringá, Paraná State, Brazil
Presenting author contact e-mail: dralarissabcosta@gmail.com

Physical violence against women is characterized as any act which offends their integrity or health. The negative impact of social isolation on violence against women has been reported. According to brazilian law, when offense leaves traces, it is mandatory to carry out a forensic examination. The aim of this research was to evaluate influence of pandemic on personal profile and prevalence of bodily injuries in women victims of violence, according to Scientific Police of Paraná State data, in Maringá city. The sample was consisted by forensic reports from physical violence against women, issued from January 1st, 2018 to December 31th, 2021. Profile variables were called "Marital Status", "Age Group" and "Skin Color". Applied variables considered "Instrument or Injurious Means", "Location of the Injury in the Body" and "Injuries Nature". Data were plotted and treated statistically using EPI INFO 7.2.5.0 and Bioestat 5.4 software and presented in a descriptive and analytical way. Results show a significant drop in women victims of violence forensic reports in post-pandemic period (-55.7%). Statistical association between pandemic and profile variables was found. When marital status was analyzed, a significant reduction was observed in minors forensic reports (-69%) and women with partners (-53%). For age group, there was a significant reduction in teenagers (-71%) and children (-61%) forensic reports. With regard to skin color, there was a significant reduction in assistance to brown (-75%) and white (-52%) women and some reduction in assistance to black women (-22%). However, pandemic was not statistically associated with applied variables in this study. It is concluded that Covid-19 pandemic had influence on the personal profile of women victims of violence assisted by Scientific Police of Paraná State, in Maringá city, without being associated with the configuration of bodily injuries.

Keywords: violence, gender-based violence, domestic violence

STUDENT ORAL PRESENTATIONS – COMPETITION

SP1 Dental age assessment using a deep learning approach

Author/s: Valon Nushi-3,5, Rui Santos-2,4, Arlindo Oliveira-6,7, Alexandre Francisco-6,7, Hrvoje Brkić-1,8, Cristiana Palmela Pereira-1,3,4,5
Institution Affiliation/s: 1 Faculty of Dental Medicine, University of Lisbon, 2 School of Technology and Management, Polytechnic Institute of Leiria, Portugal, 3 Faculty of Medicine, University of Lisbon, 4 Center of Statistics and its Applications, University of Lisbon, CEAUL, 5 Biomedical and Oral Sciences Research Unit (UICOB), Dental Forensic Sciences Research Group (FORENSEMED), 6 Institute for Systems Engineering and Computers: Research and Development in Lisbon (INESC-ID), 7 Superior Technical Institute, University of Lisbon, Portugal, 8 School of Dental Medicine, University of Zagreb, Croatia
Presenting author contact e-mail: nushi.valon@gmail.com

Objective: The main objective is to establish the most suitable anatomical tooth stage to perform dental age assessment through several scoring systems and age estimation methods. To achieve this objective, we will use deep learning techniques, namely convolutional neural network (CNN) for age estimation. Once implemented, we will be able to compare the accuracy and precision of the traditional methods with the deep learning method. Materials and Methods: 500 orthopantomographic images (OPGs) from Portuguese population (274 females and 226 males) aged between 12 to 25 years old were collected from the database of Lisbon North University Hospital Center, approved by the Ethic Committee. The following scoring systems were applied on the third molar: Demirjian (1973); Moorrees, Fanning, and Hunt (1963); Gleiser and Hunt (1955). Applied age estimation methods were Haaviko (1970), Liversidge (2008), and Kullman (1992), Lee et al. (2009), Caldas (2011), and Mincer (1993), and Köhler (1994). The 500 OPGs are the first ones for a bank of radiography of 3000. The OPGs analysis was allocated to 2 observers. After the validation, traditional and machine learning methods were applied to the data for age estimation. The accuracy and precision assessment were performed on a new sample of 125 OPGs. Results and conclusion: This is part of a PhD program and is in progress until 2026. The task of clustering and classification of OPGs and classification of radiographs using CNN will allow the researchers to discover patterns on collected data images. These patterns will be useful not only for enriching classification and prediction models, but also for designing explainable models. If the application of CNN is successful at classifying radiographs, a specific architecture, data processing and hyperparameter values will be derived with another larger OPG sample. This model will be integrated in a system to be developed and made available.

Keywords: Dental Age Assessment, Convolutional Neural Network

SP2 Dental age assessment by portuguese scoring systems tables

Author/s: Ana Rodrigues - 1,3, Valon Nushi -1,4, Rui Santos - 2,5, Francisco Salvado - 1,4, Cristiana Palmela Pereira - 1,3,4,5
Institution Affiliation/s: 1 - University of Lisbon, 2 - Polytechnic Institute of Leiria, 3 - FMDUL, 4 - FMUL, 5 - CEAUL
Presenting author contact e-mail: amp.rodrigues.3@gmail.com

Objective: In Portugal, as in many other countries, it is customary for legal decisions to require proof of being under or over the legally defined age limits. The relevant age limits in Portugal for various legal issues range from 14 to 21 years of age. The main objective of this preliminary research is to create individual tables for each scoring system for dental age assessment, applicable to the Portuguese population. Materials and Methods: A sample of 500 orthopantomography images (OPGs) from Portuguese population (274 females and 226 males) aged between 12 to 25 years old were collected from the database of Lisbon North University Hospital Center, approved by the Ethic Committee. The final total of sample will be 3000 OPG until the end of 2026. Cross-sectional research was carried out to assess chronological age based on the stages of third molar development. Dental development was assessed using the following scoring systems: by Haaviko (1970), Kullman (1992), Moorrees, Fanning and Hunt (1963), Mincer (1993), Demirjian (1973), Gleiser and Hunt (1955). To assess reliability, 125 randomly selected OPGs were examined by 2 independents researchers, twice by each researcher with an interval of one month between the 2 observations. Results and conclusion: Results will be studied according to sex and age for each third molar (18, 28, 38, 48). Therefore, the age distribution (in percentiles) by stage of mineralization in each scoring system, by sex and by tooth is evaluated. Hence, the probability of excluding age younger than 16 years, 18 years and 21 years based in staging scoring is provided.

Keywords: Age Assessment, Portuguese Scoring Systems Tables

SP3 Artificial intelligence for dental radiographic age estimation on a Brazilian population

Author/s: Anna Lygate, Scheila Manica, Hemlata Pandey, Ademir Franco
Institution Affiliation/s: University of Dundee, UK
Presenting author contact e-mail: AELygate@dundee.ac.uk

Aim: To investigate if artificial intelligence (AI) can predict whether an individual is under or over 16 based on their lower left mandibular third molar on a dental panoramic tomography radiograph. Methods: A sample of 5040 radiographs were used to train and validate artificial intelligence software (DenseNet121) to recognise patterns in the images which can be used to classify the radiographs into belonging to either age over 16 or under 16. Firstly, the sample of radiographs (n = 4200; 2100 males and 2100 females) between the age of 6 and 22.9 years (with age 16 being in the middle of this range) were obtained. Then, the images were annotated, outlining the features of the dentition: the left-hand side of the dentition and the lower left mandibular third molar and this data send to DensNet121. Results: Confusion matrices and AUC graphs showed that the accuracy of classification by the AI was more sensitive, specific and precise for males over females, with an overall accuracy of 0.88 and 0.83 respectively. The rate of false positives was higher in females (0.17) than males (0.09). Discussion: AI for age estimation is accurate and the difference between males and females was minimal and indicates the utilisation of future use of AI to aid dental age estimation.

Keywords: dental age estimation, artificial intelligence

SP4 Scoping review of Forensic Odontology training programmes based on the World Wide Web resources

Author/s: Ranya Al Ghazi, Alexander Gardner, Peter Mossey, Mark Hector, Scheila Manica
Institution Affiliation/s: University of Dundee, Dundee, United Kingdom
Presenting author contact e-mail: alghazi.ranya@gmail.com

Objectives: This website scoping review aimed to provide information on three categories: availability, content, and quality of Forensic Odontology education globally with the following steps: (i) conduct a website scoping review of Forensic Odontology programmes, and (ii) review the range of information provided by Forensic Odontology programme websites. Methods: The web search engine 'Google Search' was used to gather information on master and postgraduate diploma programmes between June and July 2022. The results were charted using three categories: 1) Presentation, 2) Accessibility and 3) Content with 17 different subcategories in 6 steps. Results: The search recognized 56 postgraduate master programmes in Forensic Odontology including 14 master and 46 diploma programmes. Only 7.14% of the programmes made information from all 17 subcategories available on their websites. Conclusion: There are no international training standards in Forensic Odontology. This study developed an international database of postgraduate Forensic Odontology programmes.

Keywords: Forensic, Odontology, Dentistry, Masters, Diploma

SP5 Testing of the accuracy and reliability of automated dental status registration based on convolutional neural networks

Author/s: Ajla Zymber Ceshko 1, Marko Subašić 2, Denis Milošević 2, Ivana Savić Pavičin 3, Marin Vodanović 3
Institution Affiliation/s: 1 School of Dentistry, FAMA College, Prishtina, Kosovo, 2 Faculty of Electrical Engineering and Computing, University of Zagreb, 3 Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, Croatia
Presenting author contact e-mail: ajlazymberi@hotmail.com

ABSTRACT Objectives: The aim of this study was to determine the quality of automated recording of dental status using convolutional neural networks. Methods: The total sample consisted of 813 orthopantomograms, randomly selected from the collection of the Department of Dental Anthropology. Within the GIMP program, the entire circumference of each tooth was delineated, including the crown and root (22,711 marks). Each dental intervention as filling, root canal filling, crown, bridge, dental implants, as well as tooth decay, tooth germs, retained roots, missing teeth were marked. Of the total sample, 75% was used to train convolutional neural networks, and 12.5% was used for each, validation and testing group. Results: The best performance was achieved by the large variant of UNet. The Sorensen–Dice coefficient for teeth is 95.12%, and the most successful model for the segmentation of alterations is for fillings with a Sorensen–Dice coefficient of 77.11%. Root canal filling segmentation follows closely with a Sorensen–Dice coefficient of 74.319c, and the segmentation of crowns and tooth decay performs worse, with a Sorensen–Dice coefficient of 44.74' and 24.58'7c respectively. Conclusion: The large UNet variant is the biggest and slowest model and can process 100 images in 2.4 seconds. Manual segmentation of panoramic dental x-ray images is a very arduous task, and it can take between 30 to 40 minutes per image for a trained expert. By applying neural networks, it is possible to create an automated registration of dental status with a satisfactory degree of precision and reliability. The processing of a large amount of information results in significant time savings. Given the high level of precision and recall of automated tooth recording from orthopantomograms, we can conclude that it could be successfully applied in clinical and forensic profession.

Keywords: Dental Records, Artificial Intelligence

SP6 Eyeball position in facial reconstruction employing Cone-Beam Computed Tomography (CBCT) from Brazilian population

Author/s: Letícia Vilela Santos-1, Thiago Leite Beaini-2, Gabriela Nobre Silva- 1, Rodolfo Francisco Haltenhoff Melani- 1
Institution Affiliation/s: 1 University of Sao Paulo, Faculty of Dentistry, Brazil, 2 University of Uberlandia, Faculty of Dentistry, Brazil,
Presenting author contact e-mail: leticiavilelast@gmail.com

Forensic facial reconstruction (FFR) involves the approximation of facial features to produce a recognizable face. The eyes play a crucial role in this task, and it is essential to determine eyeball position, which can vary across populations. This study aimed to establish parameters for locating landmarks of the eyes for FFR purposes. The pupils (p'), endocanthion (en'), and exocanthion (ex') were found in 70 CBCT exams. Cephalometric standards were used to align the skulls, and the p' location was measured from orbital structures (mo, mio). The width (mo-ec) and height (mio-mso) of the orbit were also registered. The angle between en'-ex' and a sagittal vertical line was measured, as well as the p' projection from an orbital tangent line. A correlation matrix established the influence of horizontal and vertical p' position with the width and height of the orbit, respectively. Two methods were tested as linear regressions and average proportions were calculated from 50 of the CBCTs and tested in the 20 remaining exams. Descriptive analyses were obtained from the Jamovi® software and a comparison between the estimated p' and the real p' for each method was calculated to test its accuracy. In proportions, the landmark p' was approximately 58% of the width and 46% of the height. The projection of p' was on average 3.4 mm from the orbital tangent and de en'-ex' showed an angle of 89° from the vertical plane. The distance between en'-ex' is approximately 74% of the orbit width as the distance between en'-p' represents 56%. The linear regression formulas and the proportional method resulted in similar accuracy, showing less than 2mm of average difference from the real p'. The resulting proportions established parameters for placing the eyeballs and their surrounding structures for FFR of Brazilian skulls.

Keywords: forensic facial reconstruction, eyeball position, CBCT
Sponsorship Acknowledgement: CAPES

SP7 Biological profiling using the human mandible- a systematic review

Author/s: Doha Abualhija-1, Julieta Gomez Garcia-Donas-2, Simon Shepherd-3, Scott McGregor-4, Ademir Franco-1, Scheila Manica-1
Institution Affiliation/s: 1 Centre for Forensic and Legal Medicine and Dentistry, University of Dundee, UK, 2 Centre for Anatomy and Human Identification, University of Dundee, UK, 3 Department of Oral Surgery and Medicine, University of Dundee, UK, 4 Assistant Librarian, University of Dundee, UK
Presenting author contact e-mail: doha.abualhija@yahoo.com

Objectives: To review the scientific literature on biological profiling by analyzing the human mandible and mandibular remains. Methods: a systematic literature review was conducted on four databases: PubMed, ScienceDirect, Scopus, and Latin American and Caribbean Health Sciences Literature (LILACS). The review included cross-sectional studies published in English before 2021. The search strings were designed by combining the MeSH terms and keywords by Boolean operators "AND" and "OR": Forensic Anthropology, Forensic Dentistry, Forensic, Mandible, Human Mandible, and Jaw. A risk of bias assessment using the Joanna Briggs Institute's (JBI) critical appraisal tools was undertaken. The data were presented descriptively and analyzed using Microsoft Office, Excel 365 (version 2302). Results: The primary search identified 2524 articles, of which 104 met the eligibility criteria; 80 were assessed for low risk of bias. Most of the articles examined the sexual dimorphism of the mandible (n=94), and 25 attempted to estimate age. However, ancestry and stature were the least explored biological characteristics (5 and 1 article, respectively). Metric analysis was the most used approach (n=80 articles) compared to morphological analysis (n=18) with morphologic and metric techniques combined (n=16). Results also showed that Orthopantomograms continue to be the preferable type of radiograph. Conclusion: Based on the number of studies that demonstrated good accuracy, the mandible proved to be a reliable skeletal element for sex estimation. However, more studies exploring age, stature and ancestry are needed.

Keywords: anthropology, mandible, profiling, sex, age, ancestry

SP8 Dentists and child abuse and neglect- a review

Author/s: Diana Astori Nogueira- 1, Cristina Paiva Figueiredo- 2, Ivana Čuković-Bagić- 3
Institution Affiliation/s: 1 Faculty of Dental Medicine, Catholic University of Portugal, 2 Department of Forensic Dentistry, Faculty of Dental Medicine, Catholic University of Portugal, Portugal 3 Department of Pediatric and Preventive Dentistry, School of Dental Medicine, University of Zagreb, University Clinical Center Zagreb, Croatia
Presenting author contact e-mail: diana.astori18@gmail.com

Objective: Child abuse and neglect pervade all populations. Dental professionals are more likely to see abuse and neglect signs in their daily practice. Unfortunately, abused and neglected children usually go unreported due to lack of dental professionals' adequate knowledge and willingness to report. There is a need to highlight the identification of abuse in dental settings and the need of knowledge improvement to tackle such cases if they come across one. The main objective of this review is to show the reasons of (non)recognizing and (non)reporting child abuse and neglect cases. Methods: An Internet review on PubMed, VHL and Scopus electronic database was conducted according to PRISMA protocol. Published and unpublished primary studies and reviews from 2013-2023 were included in this research. The search strategy was focused on the use of MeSH terms and key words to find relevant publications, followed by an abstract and full-text review. Results: A total of 99 articles were included in our literature review. Mapping research shows the need for a greater approach in relation to dentists' knowledge in recognizing cases of child abuse in daily practice and in how to deal with the situation. All selected articles highlighted the same problem in general, showing the great importance of education in this field. The selected articles mentioned the same problems in different countries. The amount of unpreparedness of dental professionals in diagnosing and preventing further child abuse is considerable high. Conclusion: The review enhanced the need of abuse and neglect issue awareness in dental profession. Improvement of education on procedures about child abuse and neglect recognizing and reporting in order to intercept abuse and protect vulnerable children are strongly recommended, professionally and institutionally.

Keywords: child abuse, knowledge, education, dentist

SP9 Automatic tissue removal from 3D dental photoscans

Author/s: Anika Kofod Petersen -1, Andrew Forgie -2, Dorthe Arenholt Bindslev -1,3, Palle Villesen -4, Line Staun Larsen -1,3
Institution Affiliation/s: 1 Department of Forensic Medicine, Aarhus University, 2 School of Medicine, Dentistry and Nursing, University of Glasgow, 3 Department of Dentistry and Oral Health, Aarhus University, 4 Bioinformatics Research Centre, Aarhus University
Presenting author contact e-mail: anko@forens.au.dk

Affiliations: Objective: Intraoral 3D photoscans are increasingly used in dentistry and included in dental records. For forensic odontology identification purposes, when ante mortem dental records are compared to post mortem dentitions to identify deceased, the photoscans in the dental records can be compared with post mortem photoscans. However, differences in soft tissue conditions between ante mortem and post mortem scans can cause misleading variation, making it difficult to automate the matching process. Previous studies have successfully separated teeth and gingiva on full dental arches, but for forensic cases, an automated to handle dental arches with missing teeth and malocclusion would be advantageous. Methods: To address this challenge, we have developed the grid cutting method, which splits 3D dentition models into squares and analyzes each square separately. By comparing the distance from the occlusal plane to the highest point of the dentition model squares with a user-defined inclusion threshold, the method can remove most gingiva from the scan. Furthermore, the method is customisable, allowing for fine-grained analysis using a small grid size and variation in the degree of gingiva included in the final model. Results: The grid cutting method has been found to be robust and suitable for both full dental arches and those with missing teeth and malocclusion. Conclusions: Overall, the grid cutting method represents an important step towards automating the identification process in forensic odontology using intraoral 3D photoscans.

Keywords: Forensic odontology, DVI, Automation, Photoscans
Sponsorship Acknowledgement: AUFF NOVA, Aarhus University Research Foundation

SP10 Sensitivity and specificity of quantitative methods for sexual diagnosis

Author/s: Diana Augusto-1,4,5, Rui Santos-2,4, Ana Rodrigues-1,4,5, Vitoria Ionel-1, Cristiana Palmela Pereira-1,3,4,5

Institution Affiliation/s: 1 Faculty of Dental Medicine, University of Lisbon, 2 Polytechnic Institute of Leiria, 3 Faculty of Medicine, University of Lisbon, 4 Center of Statistics and its Applications, University of Lisbon, CEAUL, 5 Biomedical and Oral Sciences Research Unit (UICOB), Dental Forensic Sciences Research Group (FORENSEMED)

Presenting author contact e-mail: dianaaugusto@campus.ul.pt

Objective: The aim of this study is to assess sensitivity, specificity, accuracy, area under the ROC curve (AUC) and the best cut-off points for sex classification in a Portuguese population for each of the evaluated craniomandibular radiologic parameters. Methods: A total of 206 orthopantomographic images were selected from individuals, Portuguese adults older than 25 years, where 116 of them were females and 90 were males. From each collected orthopantomography, 14 linear variables were measured using the ImageJ® software. The collected data were analyzed with IBM SPSS® software Statistics 28. Logistic regression and ROC curve were applied to determine the best cut-off points and the respective sensitivity, specificity and accuracy of the classification. Results: The AUC values can vary between 0.5 (random classification) and 1 (perfect classification). Hence, higher the AUC value, more reliable is the classification procedure. The variables with higher AUC were the height of the right (0.861) and left (0.850) mandibular ramus. Logistic regression model using all variables in sex classification was also used. Based on the derived formula, the probability of each male can be estimated and, therefore, the sex classification can be obtained with the cut-off point of 0.5 (if the estimated probability is greater than 0.5, the individual is classified as male, otherwise as female). With a significance level of 5 percent, some variables were considered non-significant and were removed from the model. This way, an accuracy of 83.0, sensitivity of 86.2 and specificity of 78.9 were obtained through the logistic regression including significant variables, with AUC of 0.887. Conclusion: The obtained results indicate that sex classification is more reliable using logistic regression with some variables than using only one of these variables, even if it is the most discriminating.

Keywords: Sexual Diagnosis, Forensic Odontology

SP11 Sex and age determination using Raman spectra of dentine

Author/s: Luka Banjšak -1, Ozren Gamulin -2, Minja Birimiša -1, Marin Vodanović -1, Hrvoje Brkić -1
Institution Affiliation/s: 1 Department of Dental Anthropology, School of Dental Medicine, 2 Department of Physics, School of Medicine, University of Zagreb, Croatia
Presenting author contact e-mail: lbanjsak@sfzg.hr

Aims To determine the sex and age of humans by recording the RAMAN spectra from extracted teeth on dentine. Materials and methods 25 male and 26 female extracted teeth were collected. The teeth were then disinfected and fixed in auto acrylate and cut near the cervical margin, apically. The exposed part of dentine was then recorded with a Raman spectrometer. Each dentine site was recorded with 100 scans in the spectral range between 3500 and 100 cm-1 and resolution of 4 cm-1. The excitation was an NdYaG laser at 1064 nm wavelength with laser power of 500 mW. All spectra were background corrected then normalized and decomposed by principal component analysis (PCA) (MATLAB) In order to inspect the difference between spectra based upon the age of the sample we observed the prominent vibrational bands and statistically analyzed them. For sex differentiation we used the T test on acquired data and explored the vibrational bands with the biggest intensity differences. Results In the group of male samples the segmentation of spectra built on the age of teeth at the time of extraction is visible. The accuracy of age estimation is 7.0 years respectively. R2: 0,861 In the group of male samples the segmentation of spectra built on the age of teeth at the time of extraction is visible. The accuracy of age estimation is 9.4 years respectively. R2: 0,749 While observing the difference between spectra of both male and female samples a distinction was observed. Conclusion Recorded spectra were organized into datasets and analyzed with principal component analysis, which showed that sex determination with Raman spectra of teeth is possible. In addition, the results showed that age estimation using Raman spectra is also possible. The difference in classification accuracy between sexes is observed.

Keywords: Age determination, Raman spectroscopy, forensics
Sponsorship Acknowledgement: This research was funded by the Croatian Science Foundation within the project: IP-2020–02-9423 — Analysis of teeth in forensic and archaeological research

Invited Lectures II

IL5 Calais migrant identification in November 2021

Author/s: Drogou Saout Gwenola -1,2 Lise Malfroy Camine -1,2 Michael Guigon -2,3 Aymeric Leguillier -2, Anne Becart -4,5 Cecile Wallaert -4, Aime Conigliaro -2
Institution Affiliation/s: 1 French Association of Forensic Odontology, 2 Forensic Science Laboratory of the French Gendarmerie, 3 Nice Hospital, 4 Medico-legal Institute Lille, 5 Lille Hospital, France
Presenting author contact e-mail: gwenola.drogou@gmail.com

This communication aims to present the identification mission set up by the Institute of forensic sciences of the French gendarmerie (IRCGN) at the medico-legal institute in Lille for the 27 migrants of several different nationalities who tried to cross the English Channel to reach England in November 2021. A complete identification protocol according to Interpol recommendations was set up with 2 identification chains and a pair of odontologists for each. Each pair was made up of an experienced forensic odontologist and a forensic odontologist who had never worked on such a mission. These 4 forensic dentists are reservists with the IRCGN. The team was completed by 2 forensic dentists from IML Lille. The primary (fingerprints, DNA, odontology) and secondary (tattoos, scars, etc.) elements were recorded on the bodies. Exo- and endobuccal photographs, an endobuccal clinical examination with the writing of an odontogram, and retro-alveolar x-rays were done. The data was then entered into the INTERPOL file. An Ante-Mortem dental team was also set up. In this case of clandestine migration, it was very difficult, if not impossible, to obtain dental information (files and AM dental X-rays). It turned out that photographs were the most common element of AM data found in mobile phones, either selfies or photographs taken by friends, family, or fellow migrants. We will explain how work on the use of these photographs must be carried out to refine the qualification of the comparisons made: probable, possible, or non-usable photographs. The return of the identified bodies to the families was organized by the mortuary chamber of the Lille University Hospital with great respect for ethics. Some bodies were repatriated to the country of origin, others buried on French soil.

Keywords: Disaster Victim Identification, forensic odontology

IL6 Dental malpractice in Italy- major and minor events and legal consequences

Author/s: Vilma Pinchi-1, Ilenia Bianchi-1, Paolo Coprivez -2, Marco Lorenzo Scarpelli-3
Institution Affiliation/s: 1 Medical Forensic Sciences, University of Florence, 2 Orisbroker, National Association of Italian Dentists, 3 Ex Spin-off authorized by University of Florence, Italy
Presenting author contact e-mail: vilma.pinchi@unifi.it

The presentation will start with a brief discussion about the civil and criminal law and the framework of dentist's responsibility in Italy. Given the lack of national data bank that collects civil or criminal trials or claims against health professionals, the incidence of litigation in dentistry and the occurrence of criminal proceedings against dental practitioners can be examined only through reports of some insurances (Orisbroker – National Association of Italian Dentists) or anecdotally through cases of large experienced experts. The trend and the features of claims and damages due to dentist's liability in Italy will be discussed. The incidence of claims demonstrated to be quite flat during the last 15 years, even it emerges an increasing of average compensations awarded to damaged patients. Oral surgery, implantology, prosthetic and orthodontics resulted the most affected branches. Furthermore the negative occurrences of dental treatments will be discussed relating to three different categories of increasing severity of consequences both for patient and the claimed dentist: 1- failure of treatments. Therapies should be basically repeated and the main loss suffered by patient is economic. 2- Minor events. Some minor physical impairments occurred to patients. 3- Maior events such as endocarditis, cerebral abscess, mediastinitis, death of patient. The presentation will focus on deaths at dentist's clinics or deaths of patients due to dental treatments as rare, but quite worrying circumstances in which involved dentists generally undergo a criminal proceeding and risk, if negatively sentenced, to pay a relevant compensation.

Keywords: dentist's liability, litigation in dentistry

IL7 The uniqueness of the human dentition revisited: a logical approach to the current impasse

Author/s: Herman Bernitz
Institution Affiliation/s: University of Pretoria, South Africa
Presenting author contact e-mail: bernitz@iafrica.com

Over the past four decades several authors have tried to prove the uniqueness of the human dentition. The scientific method and its reliability have all been questioned and in general rejected by the broader forensic community. The author himself has spent many years trying to prove this uniqueness. Applied mathematicians, physicists and forensic dentists have been approached, with no meaningful success. It has become clear that the only unique dentition is a skeletal dentition. Here all wear is static, chips striations and imperfections are static and unique at a certain level of magnification. The dynamic/living dentition is subject to microscopic/molecular change every time the upper and lower teeth make contact, creating infinite changes, an infinite number of times. The presentation will address the many theories of prominent forensic scientists who decades ago stated that all natural products, which would include the dentition are unique, but in the case of the teeth, unique but also dynamic. The mere fact that no one has proved the uniqueness of the human dentition by 2023, confirms the hypothesis that it is not possible. The presentation will conclude by explaining how bite mark analysis can accommodate this reality. By understanding the importance of magnification, quality, quantity and the presence of recognizable features within the dentition can we justify the analysis of bite marks within the forensic dental armamentarium.

Keywords: uniqueness, dentition, infinite

IL8 Forenisc age assessment. AGFAD recommendations and new developments: a review

Author/s: Andreas Schmeling
Institution Affiliation/s: Institute of Legal Medicine Muenster
Presenting author contact e-mail: andreas.schmeling@ukmuenster.de

In 2008 the international and multidisciplinary Study Group on Forensic Age Diagnostics (AGFAD) published recommendations for age assessments in adolescents and young adults. These recommendations include a combination of a physical examination with medical history, an X-ray examination of the hand, and a dental examination with preparation of an orthopantomogram. When hand skeletal development is complete, an additional CT scan of the clavicles needs to be performed. Depending on the legal issue, the minimum age and/or the most probable age of the person examined needs to be specified in the age assessment report. If the exceeding of a legally relevant age limit is to be assessed with the highest level of certainty ("beyond reasonable doubt"), the minimum age concept is to be applied. The minimum age results from the age minimum of a specific characteristic on a measuring scale in the reference study used. The application of the minimum age concept avoids unjustified legal disadvantages for persons without valid identification documents. Both hand ossification and third molar mineralization may be completed before the age of 18 Therefore, the assessment of clavicular ossification is of crucial importance for the evaluation of the completion of the 18th year of age, since the medial clavicular epiphysis is the last to ossify of the entire skeleton and still shows developmental processes after the completion of the 18th year of age. In an effort to replace X-rays with non-radiographic imaging techniques, both MRI-based and sonographic studies have been performed in recent years. The examination of the knee by means of a 0.31 Tesla MRI scanner and the development of an MRI specific classification of ossification stages might be the future of forensic age assessment.

Keywords: age estimation, AGFAD, recommendations, MRI

IL9 Quality assurance and IOFOS

Author/s: Tore Solheim
Institution Affiliation/s: Institute of Oral Biology, Dental faculty, University of Oslo, Norway
Presenting author contact e-mail: tore.solheim@odont.uio.no

Quality assurance is most important in forensic medicine and forensic odontology. Everyone who takes on him or her a legal forensic odontology commission should have a system for quality control as a background for the work. This is to ensure a reasonable quality of the work and the report. This is also important to ensure respect and trust in the legal system and for you as an expert. IOFOS has tried to help forensic odontologists around the world by setting up some suggestions for quality assurance, which can be found on IOFOS home page. This has not been easy as there are big national differences and above all individual differences in opinion among the forensic odontologist. The efforts of IOFOS will be discussed. It is recommended that forensic odontologists states in the report that the work has been carried out and the report written according to IOFOS recommendations for quality assurance. Some critical remarks will be given and suggestions of the how to proceed in the future.

Keywords: quality assurance, forensic odontology, IOFOS

Oral presentations AGE ESTIMATION

026 5-part tooth segmentation method using CBCT and machine learning models for dental age estimation in adults

Author/s: Rizky Merdietio Boedi -1,2, Simon Shepherd -3, Scheila Manica -1, Ademir Franco -1,4
Institution Affiliation/s: 1 Centre of Forensic and Legal Medicine and Dentistry, University of Dundee, Dundee, United Kingdom, 2 Department of Dentistry, Faculty of Medicine, Universitas Diponegoro, Semarang, Indonesia, 3 Department of Oral Surgery, School of Dentistry, University of Dundee, Dundee, United Kingdom, 4 Division of Forensic Dentistry, Faculdade São Leopoldo Mandic, Campinas, Brazil
Presenting author contact e-mail: rizkymerdietio@lecturer.undip.ac.id

Objective: Each part of a tooth's regressive changes correlates differently to chronological age (CA). As such segmentation method needs to be developed to achieve a more reliable dental age estimation (DAE) outcome in the adult population. This study examined the predictive performance of the newly developed method 5-Part Tooth Segmentation (using CBCT images through supervised machine learning (SML) models, such as support vector regression (SVR) and regression tree (RT) for DAE in adults. Methods: Ninety-nine CBCT scans from patients aged between 20-60 were collected. A total of 80 eligible teeth were evaluated for each maxillary anterior tooth type. The method was applied utilising 5 different age-related volumetric tooth parameters, namely: Pulp Chamber Volume (PCV), Dentine Volume (DV), Enamel Volume (EV), Lower Root Chamber Volume (LRCV), and Lower Hard Tissue Volume (LHTV). The measured parameters were then converted to the ratios; 1) Pulp to Dentine Volume Ratio (PCV/DV); 2) Enamel to Dentine Volume Ratio (EV/DV); 3) Lower Tooth Volume Ratio (LRCV/LHTV) and used as predictor variables to predict CA. Results: The mean time to segment 1 tooth was 44.62 ± 8.44 minutes. The predictive performance of SVR and RT was comparable to standard multiple linear regression (MLR). The best-performing model was the MLR model applied to the maxillary canine (R^2 = 0.69). Conclusion: The results suggest that theSG approach offers acceptable performance when predicting CA for adults. However, the method is time intensive with a steep learning curve. The utilization of SVR and RT gives a similar result to the MLR model, indicating that to improve the model performance: 1) a fundamental change in the methodology needs to be performed, or 2) other teeth need to be observed and segmented based on their age-related volumetric information.

Keywords: CBCT, Dental Age Estimation, Forensic Dentistry
Sponsorship Acknowledgement: R. Merdietio Boedi received a scholarship funding by the Ministry of Education and Culture, Universitas Diponegoro.

027 Validation of non-invasive dental feature-based age estimation methods for Korean adults with panoramic radiographs

Author/s: Sang-Seob Lee -1, Sehyun Oh -1
Institution Affiliation/s: 1- Department of Anatomy, College of Medicine, The Catholic University of Korea, Seoul, South Korea
Presenting author contact e-mail: sslee1418@gmail.com

This study aimed to validate the accuracy of a previously published method for age estimation by observing the number of dental features on Korean panoramic radiographs (OPGs). A total of 118 OPGs, aged 20 to 89 years (64 males and 54 females, with a mean age of 53.89±19.83), were stratified by sex and age decade group and randomly selected from each stratum. The number of missing teeth, prosthetic teeth, filled teeth, and implants were counted, and two age estimation models were applied separately to estimate age: one using the entire dentition (Model A) and the other using only posterior teeth on both sides of the jaws (Model B). Root mean square error (RMSE) between chronological and estimated age were utilized to evaluate the accuracy of each model. Overall, Model B exhibited superior estimation performance when compared to Model A, with an RMSE of 10.589 years for Model B and 10.743 years for Model A. Furthermore, both models demonstrated comparable accuracy to age estimation methods utilized in Korean forensic practice. Model B demonstrated a more consistent estimation performance across all age groups, with a difference of 5.09 in RMSE between the best and worst performing age groups, while Model A exhibited a larger difference of 8.54 in RMSE. These results suggest that the reported age estimation using the number of dental features is a suitable for Korean forensic practice. Moreover, considering the overall accuracy and consistent estimation performance across age groups, Model B is deemed more appropriate than Model A. Given the variability in clinical circumstances across countries, the applicability of the dental treatment-based age estimation method tested in this study to other populations must be scientifically validated. Moreover, new age estimation methods should be developed and applied in practice based on data specific to each country to ensure accuracy and reliability.

Keywords: age estimation, non-invasive, Korean, OPG
Sponsorship Acknowledgement: This study was supported by a National Research Foundation of Korea (NRF) grant (No. 2022R1F1A1063719).

028 Automated assessment for dental age

Author/s: Salem Altalie
Institution Affiliation/s: Medical Examiner Office, Forensic Evidence Department, Abu Dhabi Police GHQ, Abu Dhabi, United Arab Emirates
Presenting author contact e-mail: Salem.altalie@gmail.com

Objective: To validate an automated assessment for the dental age model and assess its accuracy and consistency in predicting age, with the aim of improving the reliability of age estimation. Methods: The digitized model was developed to simplify the age assessment by considering morphological tooth characteristics and various age estimation methods using a user-friendly graphical user interface that streamlined the assessment process. 30 dentists from 20 countries were trained in digitized assessment and each tested four cases using radiograph evaluation for both conventional and digital methods. The tests included assessing deciduous dentition using the atlas technique, scoring techniques for mixed and wisdom dentition, and evaluating degenerative changes using permanent dentition measurements. Results: The digital test was found to be 20% more accurate than the conventional test, with 80% uniformity in measurements across different samples. The digital assessment process facilitated the repetition of tests, providing ease of access and convenience to examiners. Conclusion: The automated dental age assessment model is a reliable and accurate tool that has potential applications in various fields. It simplifies the assessment process, produces consistent measurements, and reduces the likelihood of human error. The model could be used to evaluate asylum seekers, devise orthodontic treatment plans, prevent child recruitment, identify athletes in competitions, and narrow down the process of identifying unknowns. The software process also helps to calibrate examiners through exercises on known cases, improving their competence and enhancing the overall practice. With its accessibility at any time or place, the application allows international experts to reach a consensus for improvements in methods and approaches. The second phase developed machine learning-based image recognition to detect tooth structures, resulting in a more dependable AI system for estimating age.

Keywords: Age Estimation, Automated Assessment, UAE

029 Dental age estimation based on 3D measurements of root dentin translucency: a pilot study

Author/s: Muhammad Zaid Zainuddin - 1, Tan Su Keng - 1, Noor Shafini Mohamad - 2, Mohd Yusmiaidil Putera Mohd Yusof - 1
Institution Affiliation/s: 1 Faculty of Dentistry, 2 Faculty of Health Sciences, MARA University of Technology, Shah Alam, Selangor, Malaysia
Presenting author contact e-mail: zaidzainuddin@uitm.edu.my

Root dentin translucency (RDT) is known to be strongly correlated with age and has been chosen as the sole parameter in age estimation in several studies. Current age estimation studies based on RDT have focused on the length and area of translucency which requires tooth sectioning. As forensic odontology requires teeth to be preserved for legal and investigative purposes, destructive methods such as tooth sectioning are unfavourable. In this study, we proposed and developed a pilot study to correlate volumetric analysis of RDT with known chronological age using high-resolution micro-computed tomography (µCT). 16 single rooted non-gender specific premolars of known chronological age from the Malay population were scanned using µCT (SkyScan 1176, Bruker, Kontich, Belgium) to assess tooth morphometrics and mineral density of the root dentin region. A high spatial resolution of 9 µm was used for the scanning with a Cu+Al filter. The X-ray source was operated at a voltage of 90 kV and a current of 298 µA. 3D volume datasets for every tooth (grey-value at every point) were reconstructed and densitometry analysis were performed on the root dentin region. Regression analysis using the volumetric data set showed promising results and positive correlation when compared against known chronological age. The µCT generated grey-scale profile of the translucent dentin region provides a reliable indicative parameter of age. Although further work is being conducted to achieve significant correlation and a reliable age predicting model, this novel dental age estimation technique shows promising results with regards to estimating age via RDT in both whole and fragmented teeth.

Keywords: Age Estimation, microCT, Odontology, Dentin

030 Dental age estimation based on cement thickness

Author/s: Minja Birimiša - 1, Jelena Dumančić - 1, Marin Vodanović-1, Sandra Anić Milošević-2, Marina Marić-1, Hrvoje Brkić-1
Institution Affiliation/s: 1 Department of Dental Anthropology, 2 Department of Orthodontics, School of Dental Medicine, University of Zagreb, Croatia
Presenting author contact e-mail: birimisaminja@gmail.com

Objective: To define a formula for assessing dental age in adults and the elderly based on the measurement of the thickness of precipitated dental cement. Methods: The study sample consisted of 206 donor teeth of both sexes. Donors' age ranged from 10 to 82 years at the time of extraction. The teeth were extracted due to therapeutic reasons. Each tooth was embedded in a quick setting auto acrylate, and the roots were cut with transverse sections on an ISOMET 1000 cutter on the six levels of the tooth's root. The thickness of each section ranged from 0.3 to 0.5 µm. Cement thickness measurements were made with the Olympus light microscope model CX43 and camera. The measurements were done at 4 measuring points of each cut, clockwise, and cement thickness for each cut was calculated as the arithmetic mean of all 4 measurements. Dental age was calculated as chronological age minus the average tooth eruption age. Results: Mean cement thickness (MCT) significantly declined from apical to cervical cuts (P<0.001, ANOVA) and was thicker in teeth with a destroyed tooth crown (P<0.001, ANOVA). MCT was significantly thicker in molars compared to incisors (P<0.001, ANOVA). MCT was higher in men and in teeth with more than one root but the difference didn't reach statistical significance. When teeth MCT was analyzed per decades of chronological age, MCT showed a significant increase from the second decade with a peek in the sixth decade and declined to the ninth decade (P<0.001, ANOVA). Using a piecewise linear regression analysis, the breakpoint age was 53 years, so two different equations were produced for two age groups (up to 53 years, and >53 years). The best prediction of the dental age was found for minimal cement thickness for first 4 cuts (apical and middle). Conclusions: According to the obtained results, there is a correlation between chronological age and cement thickness, which is applicable up to 50 years.

Keywords: forensic odontology, age assessment, tooth cement
Sponsorship Acknowledgement: This research was funded by the Croatian Science Foundation within the project: IP-2020–02-9423 — Analysis of teeth in forensic and archaeological research

031 The Demirjian method adapted for dental age estimation in the Croatian population

Author/s: Ivan Bedek -1, Jelena Dumančić -2,3, Tomislav Lauc -4,5, Miljenko Marušić -6, Ivana Čuković-Bagić -3,7

Institution Affiliation/s: 1 Bedek Dental Clinic, 2 Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, 3 University Hospital Centre Zagreb, Croatia, 4 Study of Anthropology, Faculty of Social Sciences and Humanities, University of Zagreb, 5 Apolonija Dental Clinic, 6 Department of Mathematics, Faculty of Science and Mathematics, University of Zagreb, 7 Department of Paediatric and Preventive Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

Presenting author contact e-mail: ivanbedek.ib@gmail.com

OBJECTIVE: The Demirjian method has been tested in numerous populations worldwide with variations in applicability due to the difference between chronological and dental age. Adaptations to accommodate the profile of selected populations have provided enhanced accuracy. The aim of this study is to test various adaptations of the Demirjian method that would enable a more accurate age estimation among Croatian children. METHODS: According to the Demirjian method, developmental stages for seven permanent left mandibular teeth were evaluated on the digital, standardized orthopantomograms of 1868 Croatian children (1059 boys and 809 girls) aged 5 to 16. Four adaptations were made using mathematical functions: shift, Gompertz function, logistic function and polynomial function. Each adaptation was tested using simulations in which the sample was split in half; the first part was used to determine the parameters while the second served for testing the obtained equations. Square deviations between chronological and dental age were used to compare Demirjian with its adaptations for the Croatian population. Estimation accuracy is presented as the percentage of correct estimations within intervals of ± 0.5, ± 1, ± 1.5 and ± 2 years. RESULTS: The total square deviation using Demirjian was 20.48 in boys and 18.81 in girls. It diminished in all four adaptations: 11.38 and 12.42 using shift; 12.89 and 8.55 using logistic; 14.77 and 10.77 using Gompertz; and 11.52 and 10.25 using polynomial for boys and girls respectively. The percentage of correct estimations increased significantly within all intervals across all adaptations for both boys and girls. CONCLUSION: All four adaptations of the Demirjian method showed increased accuracy of age estimation among Croatian children with a higher percentage of correct estimations within the specific interval. Verified by simulation, these adaptations would provide more accurate dental age estimation among Croatian children.

Keywords: age estimation, Demirjian, adaptation, Croatia

032 A syncretism of Demirjian and Kohler developmental stages for a more accurate age estimation

Author/s: Ashith B Acharya - 1, Poonam Prakash - 2
Institution Affiliation/s: 1 Department of Forensic Odontology, SDM College of Dental Sciences and Hospital, Shri Dharmasthala Manjunatheshwara University, Dharwad, India, 2 Department of Prosthodontics and Crown and Bridge, Armed Force Medical College, Pune, India
Presenting author contact e-mail: ashith@ashithacharya.com

Objective: The Kohler method of dental age estimation was developed using third molars only. It comprises of more stages for root development, which is an advantage over Demirjian method. However, the latter uses more numbers of teeth in age estimation which may serve to its advantage. Therefore, this study substituted the Kohler stages of third molar development in place of Demirjian stages for that tooth to determine if there is a higher age-correlation and more accurate age estimate. Methods: A total of 436 subjects (152 males and 284 females) in the age range of 9-23 years were studied. Orthopantomographs of the individuals were assessed using the modified 10-stage (stages 0-9) Demirjian method for eight mandibular left side teeth and Kohler's 10 stages (stages 1-10) for upper and lower third molars. Multiple regression analysis was undertaken with age as dependent variable and the dental developmental stages as independent variables. Results: The statistical analysis showed that combining Demirjian and Kohler stages (i.e., Demirjian FDI tooth nos. 31-37 with Kohler 38 [R = 0.85-0.87]; Demirjian 31-37 with Kohler 28 [R = 0.85-0.86]; Demirjian 31-38 with Kohler 28 [R = 0.86-0.87]; Demirjian 31-37 with Kohler 38 and 28 [R = 0.86-0.87]) produced higher correlation compared to the two methods used separately (Demirjian 31-38 [R = 0.85]; Kohler 38 and 28 [R = 0.82-0.85]) in both males and females, respectively. Standard Errors of Estimate (SEE) were lower in the syncretic approach (SEE = ±1.6-1.7 years) compared to the independent approach (SEE = ±1.7-1.8 years). Conclusion: This indicates that although the syncretic approach of combining Demirjian and Kohler stages has a higher correlation to age and produces more accurate age estimates, it does not translate to a practical difference in the current sample.

Keywords: modified Demirjian stages, Kohler method

033 Secondary dentine as an indicator of adult age a 3D CBCT method for age estimation based on pulp chamber narrowing of central incisors

Author/s: Giulia Vitale-1, Ilenia Bianchi-1, Francesco Pradella-1, Vilma Pinchi-1, Ugo Santosuosso-2, Lorella Bonaccorsi-2
Institution Affiliation/s: 1 Forensic Medical Sciences, Department of Health Science, University of Florence, Italy, 2 Deptartment of Clinical and Experimental Medicine, Human Anatomy and Histology Unit, University of Florence, Italy
Presenting author contact e-mail: giuliavitale2@gmail.com

Secondary dentin deposition throughout the life of an adult individual results in a progressive narrowing of the pulp volume. Previous studies demonstrated a significant correlation between secondary dentin deposition and age and proposed a new simple non-invasive method of geometric approximation of dental volumes using Cone Beam Computed Tomography (CBCT) with good accuracy especially for age cohorts 30-59 with errors ranging from +/-0.71 to +/-5.86 years respectively. This study aims to evaluate the accuracy of this simple and conservative CBCT method on a larger sample to better predict the subjective viability and improve the reliability of the method for intermediate age cohorts. A total of 500 CBCTs from healthy subjects aged from 18 to 90 years were collected and only the upper left central incisor was chosen to evaluate pulp/tooth volume, the most reliable tooth according to previous review. We examined other teeth, 2.3 , 3.3 that were not reliable due to the difficulty of calculating their volume on CBCT. Not sound teeth were excluded from the study. Two experienced forensic odontologists performed blinded measurements of dental volumes: the root, the pulp and the crown were assimilated to elliptical based solid cones and the volume was calculated by taking nine measurements (3 linear and 6 areas) on DICOM images using RadiAnt software. The ratio between the pulp volume and the hard tissues volume (PHr) was assumed as the significant variable for age estimation in order to reduce errors according to the following formula: PHr = Vpulp/Vht [Vht=Vtot-Vpulp, Vpulp is the volume of the pulp, Vht is the volume of dental hard tissues, and Vtot the total volume of the tooth]. An inferential analysis will be conducted by creating multiples linear regression model with age as dependent variable and PHr as predictor.

Keywords: age estimation, pulp narrowing, CBCT, adults

034 Effects of model complexity and hyperparameter optimisation on deep learning based dental age estimation on panoramic radiographs

Author/s: Barkin Buyukcakir -1, Jeroen Bertels -1, Jannick De Tobel -2, Patrick W. Thevissen -3, Peter Claes -1, Dirk Vandermeulen -1
Institution Affiliation/s: 1 ESAT, Center for Processing Speech and Images, KU Leuven, Leuven, Belguim, 2 Department of Diagnostic Sciences & Radiology, Ghent University, Ghent, Belgium, 3 Forensic Odontology Department, KU Leuven, Leuven, Belgium
Presenting author contact e-mail: barkin.buyukcakir@kuleuven.be

Objective: To train multiple convolutional neural networks (CNN) of different architectural complexity on dental age estimation using complete panoramic radiographs (OPG). To study the effects of training hyperparameters (batch size and number of available training samples) on the age prediction performance. Methods: Two datasets of complete OPGs were used in the study. The training dataset consisted of 3896 subjects with ages between 7 and 25 years. The test set used consisted of 454 subjects with ages between 7 and 27 years. Three CNN models of different complexity (EfficientNet-B4, DenseNet-201 and MobileNet-V3) were trained (1) using the complete training data and (2) using a random 50% subsample of the training set. The models were trained with 5-fold cross-validation using increasing batch sizes of 10, 20, 40, 80, and 160. Age estimation error (mean absolute error (MAE) in years) as well as "over-under 18 years of age" classification performance metrics were reported. Results: All architectures showed increased performance with increasing batch size for both training set sizes. The more complex model, EfficientNet-B4, trained on complete data (partial data, resp.) achieved an MAE of 1.00 (1.35) for batch size 10, and 0.56 (0.80) for batch size 160. The simplest model, MobileNet-V3, achieved an MAE of only 1.84 (2.96). The best "over-under 18 years classification" was obtained for the more complex model, DenseNet-201, on the test set with a batch size of 160, resulting in a precision of 0.981, a recall of 0.962 and an F1 score of 0.971. Conclusion: This study demonstrated that careful exploration and fine-tuning of deep learning model hyperparameters can significantly improve OPG-based age estimation on par with human estimation performance.

Keywords: opg, age estimation, deep learning, hyperparameter

035 Dental age estimation in Greek children based on the Demirjian method

Author/s: Anastasia Mitsea- 1 , Aliki Rontogianni- 2, Kety Karayianni- 1
Institution Affiliation/s: 1 Department of Oral Diagnosis and Radiology, Dental School, National and Kapodistrian University of Athens, Greece, 2 Depertment of Orthodontics, Dental School, National and Kapodistrian University of Athens, Greece
Presenting author contact e-mail: anastassiamitsea@gmail.com

Objective: The aim of this study is to estimate dental age in a population sample of Greek children using the Demirjian method. Materials: Caucasian children's panoramic radiographs obtained while they were receiving dental care were used as this retrospective study's source of data. The selected OPGs were of good quality, did not revealed dental pathologies and belonged to children with a free medical history that did not have any congenitally absent or supernumerary teeth. The sample consisted of 464 OPGs from children between the ages of 6 and 15 (mean age, 10.49 ± 1.82 SD), with 232 OPGs from males and 232 from females. Using the Demirjian et al. 1973 criteria, one observer assessed each OPG. The same observer reevaluated all OPGs one month later in order to assess intra-observer reliability. Both instances, the observer acted blindly concerning subjects' gender or ages. The statistical evaluation of the findings performed using the STATISTICA software. The correlation between chronological and dental age was assessed with the Pearson correlation coefficient (r). In order to evaluate method's accuracy, the linear regression model was applied with chronological age being the dependent and dental age being the predicted variable. Results: Our results demonstrated that the Pearson correlation between chronological age and dental age is r=0.8149. In addition, the correlation between chronological age and dental age in the male and female groups was r=0.8479 and r=0.7800 respectively. Conclusions: According to the results of our study, there is a statistically significant correlation between chronological age and dental age in both gender groups. Furthermore, the male group demonstrated a stronger association between chronological age and dental age.

Keywords: dental age, children, Demirjian method

036 Automated age and sex estimation from OPGs using artificial intelligence

Author/s: Marin Vodanović- 1,2, Marko Subašić- 3, Denis Milošević- 3
Institution Affiliation/s: 1 Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, Croatia, 2 University Hospital Centre Zagreb, Croatia, 3 Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia
Presenting author contact e-mail: vodanovic@sfzg.hr

Objective: The purpose of this research is to investigate the possibility of estimating age and gender from OPGs in forensic dentistry using artificial intelligence and convolutional neural networks. Methods: The dataset consists of 4035 OPGs from male (42%) and female (58%) subjects with ages ranging from 19 to 85 years. For this purpose, a convolutional neural network model derived from state-of-the-art architectures was developed. The data were divided into two subsets, one for training and model selection and one for performance evaluation. The training set contains 77% of the data, while the test set contains the remaining 23%. Results: The median error in age estimation was 2.95 years, depending on the age group. The accuracy of sex determination was 97%. Conclusion: Our automated method can estimate 64 images per second on contemporary hardware, it doesn't require human intervention for estimation, and it achieves state-of-the-art results.

Keywords: artificial intelligence, age and sex estimation
Sponsorship Acknowledgement: This research was funded by the Croatian Science Foundation within the project: IP-2020–02-9423 — Analysis of teeth in forensic and archaeological research

Oral presentations BITE MARKS

037 Bite marks - a critical comparison of methods

Author/s: Nikola M. Ekin, Rüdiger Lessig
Institution Affiliation/s: Martin Luther University Halle-Wittenberg, Institute of Legal Medicine, Halle (Saale) Germany
Presenting author contact e-mail: n.m.ekin@hotmail.de

The forensic stomatological examination of bite marks has been discussed for years. The use of bitemark comparison methods has been criticised since it became known that innocent people have been wrongfully convicted based on several incorrect reports. Public evaluation of the bitemark analysis ranges from scientifically validated and reliable methods to junk science. This led to a thorough literature search with the purpose of a critical examination and summary of the different methods of bite mark analysis. In addition, both the advantages and disadvantages of the individually applied methods were evaluated. Old and current methods of bite mark analysis have been evaluated and their reliability assessed. The research shows that no method exists without an error rate. The more individual characteristics the dentition has, the easier it is to compare with the bite marks. According to the literature the gold-standard is 2D-superimposition, which is one of the most reliable methods. 90% of odontologists use the superimposition in some form of overlay to analyse bite marks. Despite the superiority of computer generated overlays over all other methods approximately 30% of the overlays used are not computer generated. Almost 10% of odontologists still draw the dental impressions by hand. However, hand drawn overlays have a high level of inaccuracy and are not suitable for bite mark analysis. The evaluation demonstrates that bite mark analysis plays a not inconsiderable role next to the possibilities of DNA analysis in forensics. Along with other evidence, it can provide clues to identify the perpetrator. However, the methods used should always be assessed critically and should be based on scientific principles. The examiner must be well-trained and certified to keep the error rate low.

Keywords: Forensic Odontology, Bitemark analysis, Review

038 A systematic review of cognitive bias how it affects bite mark analysis and steps to prevent or mitigate against it

Author/s: Menaka Naidoo, Liam Robinson, Herman Bernitz
Institution Affiliation/s: University of Pretoria, South Africa
Presenting author contact e-mail: menaka.naidoo@gmail.com

Abstract A systematic review of cognitive bias: how it affects bite mark analysis and steps to prevent/ mitigate against it. Naidoo M, Robinson L & Bernitz H Cognitive bias has become a buzzword in forensic science, and a working knowledge of its relevance in all its aspects, including bite mark analysis, is essential. This research aims to share the results of a systematic review of current literature on cognitive bias and its effects on bite mark analysis. The systematic review used the PRISMA 2020 guidelines to search three scientific databases: PubMed®, Google Scholar, and ScienceDirect®. The search included relevant literature from the years 2000-2020. The keywords searched, were: "cognitive bias", "bite mark", "bitemark", "forensic odontology", and "forensic dentistry". The initial search yielded 287 full-text articles, of which only nine were regarded as relevant to the analysis of bite marks. It is clear from the literature that bite mark analysis is exceptionally vulnerable to all forms of cognitive bias. The authors, therefore, propose several measures which they believe will mitigate against introducing cognitive bias when analysing bite mark evidence. The list includes: creating a dentition from the bite mark before the suspect or models of the dentition are examined, making a point of having no prior information about the case, always adding extra models when performing comparisons, working as a team rather than an individual, and lastly not allowing crime scene investigators to cloud your scientific judgement to secure a hasty arrest. Cognitive bias is a reality which cannot be ignored. Forensic scientists need to be acutely aware of this bias when analysing cases to enforce measures to mitigate such bias's effects on the forensic reporting process.

Keywords: Cognitive bias, Bite marks, Forensic odontology

039 The role of bitemarks analysis in forensic identification: a systematic review

Author/s: Nikolaos Christoloukas -1, Anastasia Mitsea-1, Aliki Rontogianni-2, Cristos Angelopoulos-1
Institution Affiliation/s: 1 Department of Oral Diagnosis and Radiology, Dental School, NKUA, Greece, 2 Laboratory of Orthodontics, Dental School, NKUA, Greece
Presenting author contact e-mail: nchristoloukas@gmail.com

Objective: To systematically assess scientific evidence, published over the last decade, regarding the role of bitemarks in forensic identification. Methods: Four databases—PubMed, Scopus, Cochrane Library, and Web of Science—searched for publications published between January 2012 and March 2023. Initially MeSH terms used as keywords. In order to optimize the sensitivity of the investigation, keywords like human human bites, bitemar*, forensic, forensic identification, techniques applied in 7 different combinations on each search engine. The papers included in the review were chosen using the standards outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Two reviewers independently evaluated articles. Any disagreements between reviewers regarding the article's evidence type or whether the study met the inclusion requirements resolved by a third reviewer. Inclusion criteria were English language and human bite marks in the specific time period. Exclusion criteria were language other than English, review articles, case reports and methodologically inconsistent studies. Initially, 253 articles found. After removing the duplicates and irrelevant articles the reviewers evaluated the 13 remaining articles that included in the review. Results: Various methods used for bite mark analysis such as, intraoral scanners, digital photos, DICOM images analysis with ANATOMAGE software, semi automatized computational technology, metric method. Bitemarks analysis is a challenging procedure that necessitates expertise in combining and analyzing multiple data. Such data include the distortion that associated with the substrate (skin/item) on which the bite was identified along with the time period that has elapsed since it was discovered and studied. Conclusions: Our review's findings demonstrated that, bite mark cases should be treated with caution. Further high-quality research with more homogeneous methodology should be conducted.

Keywords: bite marks, analysis, forensic, identification

Oral presentations DENTAL & CRANIOFACIAL ANTHROPOLOGY

040 Cranial metric patterns in Brazil - characteristics and issues

Author/s: Victor Jacometti - 1, Marco Aurelio Guimaraes - 1, Luis Otavio Carvalho de Moraes - 2, Sergio Ricardo Marques - 2, Eugenia Cunha - 3, Ricardo Henrique Alves da Silva - 4
Institution Affiliation/s: 1 Ribeirão Preto Medical School, University of São Paulo, Brazil, 2 Paulista School of Medicine, Federal University of São Paulo, Brazil, 3 University of Coimbra, Portugal, 4 School of Dentistry of Ribeirão Preto, University of São Paulo, Brazil
Presenting author contact e-mail: victor.jacometti@usp.br

Anthropological methods are used to study and estimate general parameters on unindentified individuals, significantly reducing the universe of suspects of unknown human remains. Understanding cranial metric pattern variation is of paramount importance to understand how human remains can be used to estimate important biological parameters, such as sex, age and populational affinity (PA), formerly known as ancestry. Brazil, due to its high level of populational admixture, has some issues regarding craniometry. The objective of this work was to collect craniometric data from three main self-declared ethnicities in a southern Brazilian sample: Whites, Blacks and Pardos (Admixed). The sample was from a 1930s osteological collection from Sao Paulo, Brazil, consisted of 114 identified skulls. 22 different craniometric measurements, described by Howells (1989), were done on each specimen. One-way ANOVA was used to assess statistical significance between mean differences, and Tukey's post-hoc test was used to pairwise analysis, when applicable. Only 9 measurements showed mean statistical difference between PAs. When significant, differences were generally between the White and Black PA, whilst Admixed often presented an intermediate value, non-significant from others. Craniometric pattern and variation, in Brazil is still poorly understood, due to the high miscigenation load of the population. Thus, it is necessary to create a more representative anthropometric database of the Brazilian people, making anthropometric methods more reliable.

Keywords: Anthropology, Craniometry, Ancestry, Brazil.
Sponsorship Acknowledgement: Coordenacao de Aperfeicoamento de Pessoal de Nivel Superior

041 Mandibular bone quality in three different archeological series from Croatia

Author/s: Ivana Savić Pavičin-1,2, Anita Adamić Hadžić-3, Tadej Čivljak-4, Tomislav Lauc-5, Ajla Zymber Ceshko-6, Mario Šlaus-3
Institution Affiliation/s: 1 Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, Croatia, 2 University Hospital Centre Zagreb, Croatia, 3 Anthropological Centre of the Croatian Academy of Sciences and Arts, Zagreb, Croatia, 4 Dental Polyclinics Zagreb, Croatia, 5 Study of Anthropology, Faculty for Social Sciences and Humanities, University of Zagreb, Croatia, 6 FAMA College, Prishtina, Kosovo
Presenting author contact e-mail: savic@sfzg.hr

Objectives: The aim of this study was to assess the quality of mandibular bone using high quality and accurate CBCT images in archeological populations that inhabited Croatia from the medieval to the early modern period. Methods: This study was conducted on skulls from three samples (pre-Ottoman N=27; Ottoman N=32; and Vlach N=29) divided in the two age groups (15-39 years and 40+ years). The total sample consisted of 88 skulls (45 male and 43 female). On CBCT images the mental index (MI), the gonion index (GI), the antegonion index (AI), the panoramic mandibular index (PMI), the degree of resorption of the alveolar ridge (M/M), and, the cortical index (MCI) of the mandible were evaluated using the OnDemand3DApp (Cybermed, Korea). Results: There were no statistically significant differences in index values between the left and right sides of the mandibles. The results showed an expected higher value of cortex thickness in males when compared to females. Females in the younger groups had higher values of cortical thickness than those in the older age group. The Ottoman sample had significantly lower values of mandibular indices than the other two samples. Conclusion: There were no age-related differences in bone thickness in the male subjects, suggesting that hormonal changes have a stronger influence in females. The lower values of mandibular indices in the Ottoman sample may be an indicator of a specific factors that influenced this population.. The study of bone changes in archeological populations with different living circumstances and conditions may contribute to a better understanding of biocultural factors on physiological and pathological processes, which are extremely complex in bone tissue.

Keywords: bone quality, mandible, CBCT, mandibular indices

042 Croatian population variation in canine distal accessory ridge

Author/s: Jelena Dumančić - 1,2, G. Richard Scott -3, Sandra Anić-Milošević -2,4, Nataša Medančić - 5, Hrvoje Brkić -1,2
Institution Affiliation/s: 1 Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, Croatia, 2 University Hospital Centre Zagreb, Croatia, 3 Department of Anthropology, University of Nevada, Reno, NV USA, 4 Department of Orthodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia, 5 Private dental practice, Zagreb, Croatia
Presenting author contact e-mail: dumancic@sfzg.hr

Objective: Previous studies have shown geographical population variation in tooth morphology, which can be applied in populations' biodistance analysis and in ancestry estimation in forensic cases. Canine distal accessory ridge (DAR) is a trait that also shows the largest sexual dimorphism, which could be related to crown size. This research explores expression of canine distal accessory ridge and its correlation to crown size in a contemporary Croatian population. Methods: Distal accessory ridge (DAR) of the upper and lower canines was evaluated on 302 dental casts of orthodontic patients and dental students (147 females (F), 155 males (M), age range 11-25 years) using the Arizona State University Dental Anthropology System. Mesiodistal (MD) and buccolingual (BL) crown dimensions were measured on 120 casts. Correlation of the canine DAR and size was tested by Kruskal-Wallis test, and sex differences in DAR using chi-square test. Results: DAR on upper canines was found in 91.4% M and 85.7% F, comprising grades 1 to 5. The difference between sexes was not significant. DAR on lower canines was found in 64.3% M and 36.8% F, grades 1 to 5 and 1 to 4, respectfully, showing significant sex dimorphism ($p<0.0001$). Upper canine DAR showed no significant correlation with MD and BL dimensions, while lower canine DAR showed significant correlation except with the lower left MD dimension. Conclusion: DAR is a morphological trait showing high expression in Croatian population, with significant sex dimorphism only in lower canines. Results indicate that variation in trait expression could be only partly contributed to the size. It is possible that other genes are controlling canine size and morphology. These findings are contribution for further reference and use in forensic and anthropologic purposes.

Keywords: dental morphology, canines, Arizona State University Dental Anthropology System, variation, forensic dentistry, dental anthropology
Sponsorship Acknowledgement: This research was funded by the Croatian Science Foundation within the project: IP-2020–02-9423 — Analysis of teeth in forensic and archaeological research.

043 Dental characteristics in prehistoric population from archaeological site Kopilo - region of central Bosnia and Herzegovina

Author/s: Selma Zukić-1, Edin Bujak-2, Mario Gavranović-3, Naris Pojskić-4
Institution Affiliation/s: 1 University of Sarajevo, Faculty of Dentistry with Dental Clinical Centre, Department for dental Morphology, Anthropology and Forensics, BIH, 2 University of Sarajevo, Faculty of Philosophy, Department of Archaeology, BIH, 3 Austrian Archaeological Institute, Department of Prehistory and West Asian Northeast African Archaeology, Austria, 4 University of Sarajevo, Institute for Genetic Engineering and Biotechnology, BIH
Presenting author contact e-mail: szukic@sf.unsa.ba

Objective: Previous researches of archaeological site Kopilo, located in central region of Bosnia, documented settlement with layer of late bronze and iron age. The aim of this research was to examine characteristics of dentition of prehistoric population that inhabited central region of Bosnia, archaeological site Kopilo. Material and methods: Total of 46 graves with 53 individuals were excavated with poorly preserved skeletal remains. Final sample comprised of 160 teeth and three fragments of jaws. Sample was analyzed by visual inspection with digital camera using 10x magnification, radiographic examination and odontometric evaluation by digital caliper. Presence of specific dental characteristics was noted using ASUDAS reference plaques. Dental age in adults was estimated by tooth wear and in subadults was estimated using dental development. Other dental conditions, such as caries and enamel hypoplasia were noted as well. Results: Total of 160 teeth, from 16 individuals were available for odontological analysis. As expected, severe tooth wear was found, resulted in lower tooth crown height. Age distribution was from newborn to adults over 45. Odontometric analysis showed differences of teeth dimensions when compared to average teeth dimensions of contemporary population. Almost 20% of individuals had enamel extensions. In one molar tooth a fused root was found, and only one lower premolar had two roots. Two individuals had Carabelli's trait grade 2. Regarding dental pathology, 11% of examined teeth had caries. In 53,9% of teeth an enamel hypoplasia was found. Conclusion: Prehistoric population in region of central Bosnia suffered from extensive tooth wear. Dental wear itself, and combined with dental caries, show the dental problems within this population. High rate of enamel hypoplasia indicates a harsh life circumstances for inhabitants of the region. This conclusion is in accordance to lower age at death of individuals whose remains were found.

Keywords: prehistoric population, dental characteristics
Sponsorship Acknowledgement: The research was part of the project Genetic and Other Biological Specificities of Prehistoric Populations in Area of Bosnia and Herzegovina no. 27-02-35-35137-39 / 22 supported by Ministry of Science, Higher Education and Youth, Canton Sarajevo, Bosnia and Herzegovina

044 Association of non-metric dental traits using ASUDAS system in malocclusions: an aid to craniofacial identification

Author/s: Priyanka Kapoor – 1,2, Deepika Bablani Popli - 1, Aman Chowdhry - 1, Mariam Siddiqui - 1, Anurag Negi - 3, Srikant Natarajan - 4
Institution Affiliation/s: 1 Faculty of Dentistry, Jamia Millia Islamia, New Delhi, 2 School of Dental Sciences, Sharda University, Greater Noida (UP), 3 All India Institute of Medical Sciences, Bilaspur (HP), 4 Oral Pathology and Microbiology, Manipal College of Dental Sciences, Mangalore, India
Presenting author contact e-mail: pkapoor@jmi.ac.in

Objective: Dental anthropology aids forensic identification by studying metric and non-metric dental crown traits (NDCTs) in association with evolution or gene-environment play. Concurrently, disturbances in skeletal jaw growth and occlusal arrangements may show dental morphological variation and aid in craniofacial identification, but these have not yet been explored. Hence, the current study aimed to assess the frequency and severity of NDCTs in different malocclusions using Arizona State University Dental Anthropology system (ASUDAS).

Methods: The study sample comprising of dental casts of 14-30-year-old orthodontic patients was obtained retrospectively from Govt. Dental School of Delhi. Total 240 study casts were divided equally [N=60(30 males,30 females)] into four groups based on malocclusion classification. Each cast was examined for NDCTs based on ASUDAS system independently by three observers and a consensus was achieved. The observations for each class of malocclusion were recorded and statistically analyzed for association using Chi square test.

Results: Significant differences were found in frequency and severity of dental traits in different classes of malocclusion. Class I malocclusion predominantly showed winging(W) and shoveling of upper central (SH-UI1) and lateral incisor (SH-UI2). Class II malocclusion predominantly showed double shoveling (DSH), mesial ridge (lingual), premolar accessory cusp in first and second premolar (PAC-24,PAC-25), and cusp of carabelli(CC). Class III malocclusion predominantly showed hypocone absence (3-cusp UM2), deflecting wrinkle (DW), and distal trigonid crest (DTC). Besides, Class I showed higher score (score 3) for SH-U1 and Class II division for DSH (score 3 and 4). Besides, six morphological traits [SH-UI1, SH-UI2, Mesial Ridge(lingual), CC, 3-cusp UM2, cusp number] were found significantly different in males and females.

Conclusions: Dental traits show significant variations among different malocclusions and may be useful in comparative and reconstructive profiling in forensics. Large sample studies can be done in future to formulate machine-learning prediction algorithms for skeletal and dental malocclusions based on dental traits.

Keywords: ASUDAS, malocclusions, craniofacial identification

045 Inorganic and organic differences analysis in mapping of human teeth tissues

Author/s: Katarzyna Sarna-Boś -1, Kamil Skic - 2, Patrycja Boguta - 2, Agnieszka Adamczuk - 2, Marin Vodanović – 3,4, Renata Chałas - 4

Institution Affiliation/s: 1 Department of Dental Prosthetics, Medical University of Lublin, Lublin, Poland; 2 Institute of Agrophysics, Polish Academy of Sciences, Lublin, Poland; 3 Department of Dental Anthropology, University of Zagreb, School of Dental Medicine, University Hospital Centre Zagreb, Zagreb, Croatia; 4 Department of Oral Medicine, Medical University of Lublin, Lublin, Poland

Presenting author contact e-mail: renata.chalas@gmail.com

The aim of this study was to evaluate the microanalytical differences in the hard tissue layers of human teeth using advanced scanning electron microscopy (SEM) techniques together with supporting data from energy dispersive spectroscopy (EDS) measurements. The extracted sound teeth without any pathologies were divided into the following groups: incisors, canines, premolars, and molars. Samples were cut carefully to produce consecutive three-mm-thick slices. They contained a strip of enamel, dentine, and cementum. Additionally, tooth samples were broken vertically to preserve the primary structures. Specimens were used to find variations in the elemental composition of tissues for different tooth groups. The analysis of the chemical composition of the enamel showed that Ca and P were among the predominant elements. A higher ratio of the above ions for incisors compared to canines indicates a greater degree of mineralisation of the enamel of this tooth group. The analysis of the chemical composition of the dentine showed the highest O content of the all tooth tissues analyzed, while a lower P and Ca content was observed compared to the enamel. The analysis of the chemical composition of the cementum showed the lowest average O and P content, and the highest average C and N content, compared to the enamel and the dentine.

Determining the role of individual elements in the body is important from the point of view of the impact of the surrounding environment on organisms. A full understanding of the role of all elements in the human body, requires further research.

Keywords: Chemical composition, hard dental dissues, scanning electon microscopy

e-POSTER PRESENTATIONS

PP1 The influence of third molar hypodontia on dental age estimation

Author/s: Aida Selmanagić, Muhamed Ajanović, Anita Bajsman, Selma Tosum-Pošković, Lejla Redžepagić-Vražalica, Azra Jelešković
Institution Affiliation/s: Faculty of Dentistry with Clinics in Sarajevo, University of Sarajevo
Presenting author contact e-mail: hadzic_aida@hotmail.com

Objectives: The third molars are showing the greatest frequency of agenesia, also their variations in shape, size, position, time of maturation and time of eruption and tend to appear earlier in males than females. Robinson (1993) described these characteristics of third molars with this aphorism: „The only thing we can predict about a third molar is its unpredictability." Although the third molars show the great variability in the dentition, they stay like the most reliable biologic indicator available for age determination during the middle teens and early twenties, because they are the latest teeth to initiate and complete their development. The aim of this study was to determine the influence of third molar's hypodontia in dental age estimation process. Materials and methods: The survey was conducted based on a sample of 1007 Opgs of examinees, which has been analysed by three dental methods. Results: Statistical significant difference was confirmed regarding the distribution of dental age between the group of examinees with all four third molars presented and the group with the third molars' hypodontia registred, analysed by all of three methods. Conclusion: Based on the results in our study, we could conclude that third molars' hypodontia (one,two or three of them) does have influence on dental age assessment of subjects in Bosnian and Herzegovinian sample.

Keywords: third molar, hypodontia, dental age estimation.

PP2 Comparison of the accuracy of dental age estimation in East Asian countries using Demirjian's method

Author/s: Akiko Kumagai-1, Sang-Seob Lee-2
Institution Affiliation/s: 1- Division of Forensic Odontology and Disaster Oral Medicine, Department of Forensic Science, Iwate Medical University, Japan, 2- Department of Anatomy, Catholic Institute for Applied Anatomy, College of Medicine, The Catholic University of Korea, Korea
Presenting author contact e-mail: kumagaia@iwate-med.ac.jp

Objective: We hypothesized that there are differences in tooth growth and development between countries due to various factors, it was compared the accuracy of the results of estimated age which was applied the same method based on forensic age estimation to East Asian countries. Ultimately, the aim to prove the need for each country's original age estimation method, and to show the method that was derived for Japanese children. Methods: This research was based on the articles that uses the forensic age estimation method by Demirjian et al. for Korean, Chinese, and Taiwanese children. The accuracies were compared by applying the same age estimation method to 1558 Japanese children (777 males and 781 females). Results: Korean, Chinese, and Taiwanese male and female children were all reported to be older than their chronological age, with Eastern and Northern Chinese regions being the only exceptions. The same was true for Japanese children—, the estimated age for both sexes tended to be higher than their chronological age. However, there were large variations in values that indicate accuracy, is showing that the differences in tooth growth and development between East Asian countries and between sexes. Then we derived the regression equation for forensic age estimation from the maturity score obtained by evaluating panoramic X-ray images of Japanese children, according to Demirjian's criteria, by using the regression analysis method by Lee et al. Conclusions: Even considering the flow of people due to the development of the international community in the future, it is essential to establish a unique method for estimating the age of children in each country.

Keywords: Age estimation, East Asia, Development, Radiograph

PP3 The applicability of convolutional neural networks for age classification on panoramic radiographs of the Korean population

Author/s: Byung-Yoon Roh -1, 2, Won-Joon Lee -1, Eui-Joo Kim -1, Yo-Seob Seo -2, Ji-Won Ryu -2, Jong-Mo Ahn -2
Institution Affiliation/s: 1 National Forensic Service, 2 School of Dentistry, Chosun University, South Korea
Presenting author contact e-mail: n7111731@naver.com

Objective: Deep learning techniques based on neural network models are widely used for image analysis, including in the field of medical imaging such as radiography. These techniques have been recently applied to dental age estimation methods and have demonstrated a level of accuracy as high as that achieved by humans when performed manually. In this study, age estimation using deep CNN techniques was attempted on panoramic radiographs of the Korean population, and its applicability was evaluated. Method A total of 5,504 panoramic radiographs were used, ranging from the ages of 5 to 23, with 2,758 for men and 2,746 for women. 80% of the radiographs were randomly selected as the training set, while the remaining 20% were used as the test set. Age classification was performed using transfer learning with the VGG16 architecture, one of the pre-trained convolutional neural network models. For each male and female, learning was conducted on the training set to distinguish legal ages of 14, 16, and 18. Accuracy, specificity, and sensitivity were evaluated using the test set. Results When age classification was performed on panoramic radiographs in the test set using a transfer learning-based model, accuracies for classifying those under 14, 16, and 18 years old were 95.8%, 94.6%, and 90.2% for men and 97.8%, 94.9%, and 90.0% for women, respectively. Conclusion A CNN-based age estimation for panoramic radiographs of the Korean population showed results as accurate as previous studies. Image analysis techniques using deep learning technology are considered useful for estimating the age of Koreans.

Keywords: Age estimation, orthopantomography, deep learning

PP4 Neonatal line in forensic age assessment- a case report

Author/s: Jaana Hurnanen
Institution Affiliation/s: Finnish institute for health and welfare, Helsinki, Finland
Presenting author contact e-mail: jaana.hurnanen@thl.fi

Introduction: The generally problematic forensic age assessment of children under one year of age can be achieved with neonatal line (NNL) analyses of teeth. Two features in deciduous enamel development, 1) formation of the NNL, and 2) circadian rhythm of enamel development, enable a rather accurate lifespan assessment in days. Birth is a "stressful event" for the ameloblast function, causing disturbed enamel (NNL), which can be later identified in tooth ground sections under microscope. After birth, an average of 4 µm of deciduous enamel is formed daily. Using the NNL as a starting point it is thus possible to measure postnatal enamel thickness and convert it into postnatal days. Objectives: The objective was to assess the lifetime of a deceased infant who was claimed to be four weeks old. The request was made by the Finnish police. Parents, a foreign couple living in Finland, had neither informed health-care professionals about the pregnancy nor used their services and the childbirth took place at home. Thus, no medical records existed of the pregnancy or the delivery. Methods: Vertical 40-micron thick ground sections were processed from two deciduous teeth (dd 61, 73) and investigated under light and polarizing microscope. In both samples, the NLL was identified in locations typical for each tooth type. The distance between the NNL and enamel surface was measured in 3 and 4 locations in the thickest part of postnatal enamel. The average of the measurements was divided by daily secretion rate (4 µm) to obtain the minimum number of postnatal days alive. Results: Measurements: d 61: 119,42µm/4µm = 29,9 days; d 73: 114,52µm/4µm = 28,63 days. Conclusion: The forensic age assessment with the NNL analysis resulted in approximately 29 days and was in line with the information gained from the parents.

Keywords: neonatal line, forensic age assessment

PP5 Validation of Belgrade Age Formula (BAF) for age estimation on Bosnian children population

Author/s: Ksenija Zelić Mihajlović- 1,2, Aida Selmanagić- 3
Institution Affiliation/s: 1 School of Dental Medicine, University of Belgrade, Serbia, 2 Center for Bone Biology, School of Medicine, University of Belgrade, Serbia, 3 Department of Dental Morphology, Anthropology and Forensics, Faculty of Dentistry with Clinics, University of Sarajevo, Bosnia and Herzegovina
Presenting author contact e-mail: ksenijazelic@gmail.com

Objectives: A novel Belgrade Age Formula (BAF) - modification of Cameriere's European formula - has been recently developed on Serbian children population and tested on Italian sample. This method, as well as the original one, is used to estimate the age of children and was found to be correspondingly accurate. However, the novel method is simplified and much faster to perform.
The aim of this research was to test the accuracy of BAF on Bosnian children population. Methods: Panoramic radiographs of 210 healthy Bosnian children aged 7 - 14 years were analyzed by two independent researchers. Both, Belgrade Age Formula (BAF) and the European formula were accomplished, and the results were statistically analyzed.
Results: The results confirmed that BAF formula has similar accuracy as European formula but demand much less time for measurements.
Conclusion: BAF was found to be considerably accurate for age estimation of Bosnian children population.

Keywords: age estimation, Belgrade Age Formula (BAF), open apices, forensic anthropology
Sponsorship Acknowledgement: Lecturer is funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia through the grant for School of Dental Medicine, University of Belgrade (Contract No. 451-03- 47/2023-01/ 200129).

PP6 Facial analysis by photo-anthropometry in three-dimensional images for age estimation purposes

Author/s: Julia Schott de Matos - 1, Paulo Henrique Viana Pinto - 2, Caio Henrique Pinke Rodrigues - 3, Aline Thais Bruni - 3, Marco Antonio Moreira Rodrigues da Silva - 1, Ricardo Henrique Alves da Silva - 1
Institution Affiliation/s: 1 School of Dentistry of Ribeirão Preto, University of São Paulo, 2 Ribeirão Preto Medical School, University of São Paulo, 3 School of Philosophy, Sciences and Letters of Ribeirão Preto, University of São Paulo, Brazil
Presenting author contact e-mail: juliaschott.m@gmail.com

Age estimation by images is a challenge for forensic experts and analysis for this purpose can be requested when there is suspicion of crimes involving child sexual exploitation. In situations like this, the age of 18 comprises an important threshold for characterizing this crime. The aim of this research was to verify whether photo-anthropometric measurements of the face can be used to classify a facial image as coming from a person aged under or over 18 years. For this purpose, three-dimensional images of the face were used, which were obtained from participants of both sexes, aged between 17 and 19 years. The three-dimensional images were obtained with the participants' faces at rest and smiling. In each image, 43 linear measurements were taken based on landmarks on the middle and lower thirds of the face. The data obtained were subjected to univariate statistics to assess the examiner's calibration, as well as multivariate statistics to assess image classification. It can be verified that the examiner was calibrated, and that the methodology used was able to classify the images according to age, sex, and facial expression. Thus, aspects related to sex and the presence of smiling must be considered when using photo-anthropometric analysis as a forensic facial comparison method for the purpose of age estimation. It can be concluded that the set of facial photo-anthropometric measurements used in this research obtained from three-dimensional images can be useful when performing forensic facial analysis with the purpose of age estimation.

Keywoeds: Face; Face processing, Age groups

PP7 Diagnostic and treatment challenges of permanent mandibular molars with accessory roots - a retrospective clinical study

Author/s: Lucija Strmšek - 1, Iztok Štamfelj - 1, 2
Institution Affiliation/s: 1 Department of Dental Diseases and Dental Morphology, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, 2 Department of Operative Dentistry and Endodontics, University Medical Centre Ljubljana, Ljubljana, Slovenia
Presenting author contact e-mail: lucija.strmsek@mf.uni-lj.si

Objective: In permanent mandibular molars (PMMs) an accessory root occasionally develops on the lingual (radix entomolaris, RE) or buccal side (radix paramolaris, RP) of the main roots. RE and RP occur worldwide; however, the RE prevalence in first PMMs exhibits the greatest inter-population variability with Asian and Asian-derived groups at the upper end of the prevalence range. This study aims to evaluate a series of clinical cases managed by the two authors at the University Medical Centre Ljubljana. Methods: The personal archives of both authors were screened for cases involving diagnostics and/or management of PMMs with accessory roots. The dental records were retrieved, and the available radiographic images examined. A total of 33 patients (13 males, 20 females) aged between 12 and 62 years (mean age of 30.7 years) with a total of 43 PMMs were included in the study, forming a series of 17 endodontic and 26 companion cases. The type and morphological features of the accessory roots were determined. In endodontic cases, the reason for referral, history of previous treatment, clinical status, diagnosis, endodontic treatment and follow-up details were evaluated. Results and Conclusions: We identified one first PMM with a midlingually located RE, which overturns the widespread belief that in this tooth RE is synonymous with a distolingual accessory root. Misdiagnosed supernumerary root, persistent fistula and mishaps e.g., ledge formation, root canal obliteration, perforation, instrument separation were the most common cause of endodontic treatment failure and the reasons for referral. RE and RP represent a diagnostic and therapeutic challenge in clinical dentistry. Knowledge of the morphological features in affected teeth is the key to improving the success rate of various treatments and decreasing the frequency of procedural errors. Additionally, the results are interesting from an anthropological and forensic viewpoint.

Keywords: morphology, radix entomolaris, radix paramolaris

PP8 Comparative analysis of temporomandibular joint by means of CBCT and panoramic radiography in patients with and without osteoarthritis

Author/s: Matea Prenc -1,2 Tomislav Badel -1 , Dijana Zadravec -2, Sandra Anić Milošević -1, Mia Smoljan Basuga -2, Ivana Savić Pavičin -1
Institution Affiliation/s: 1 School of Dental Medicine, University of Zagreb, Croatia, 2 Sestre milosrdnice University Hospital Center, Zagreb, Croatia
Presenting author contact e-mail: mprenc@sfzg.hr

Objective. Radiographic analysis of the temporomandibular joint (TMJ) can be relevant for forensic analysis. This study compared the CBCT characteristics in temporomandibular joints (TMJs) with and without symptoms of osteoarthritis. Methods. In the period between 2014 and 2022, 162 patients (median age 42.5, ranging from 21-79; 85% female) were examined at the Department of Prosthodontics at the School of Dental Medicine, University of Zagreb. The clinical diagnostics included Diagnostic Criteria / TMD Axis I and manual functional analysis of the stomatognathic system. Due to differential diagnostics of orofacial pain, along with a panoramic radiograph, the patients' samples were imaged using a CBCT unit. This study was endorsed by the Ethics Committee of the School of Dental medicine. Results. The main purpose of CBCT imaging was the detection of condylar bone deformities as a typical pathological condition of osteoarthritis, which was determined in 126 (77.7%) patients from the sample. A rheumatologic condition as the basis of a TMJ disorder was determined in 12 (7.5%) of patients. The remaining 24 (14.8%) patients had imaging done due to differential diagnostics of orofacial pain caused by trigeminal neuralgia, subluxation of condyles, sinusitis, myalgia, and mandibular coronoid process hypertrophy. Bifid mandibular condyle was determined in 1.2% of patients: in one male as an accidental finding and in one female subject as the cause of crepitation and dysfunctional mouth opening. Lateral condylar tubercle was found in 35% of patients' joints in the sample. There is no pathological significance because this osseous formation is below the articulation plane and it is best shown by a 3D color reconstruction. Conclusion: Rare morphological features of TMJ can be useful for forensic analysis. This study has shown that in forensic orofacial expertise for criminal and civil litigation, the findings of lateral condylar tubercle had no pathological significance at all

Keywords: cone beam computed tomography, temporomandibular joint

PP9 Forensic odontology analysis of human remains found in Antarctica

Author/s: Lidia Bravo Rodriguez -1, 2
Institution Affiliation/s: 1 Universidad de la Frontera, Chile, 2 Universidad de Granada, Spain
Presenting author contact e-mail: lidia.bravo@ufrontera.cl

Objective: In 1985, in Livingston Island, Antarctic territory, an unprecedented discovery took place: a half-buried human skull on Yámana beach, Cape Shirreff. Anthropological studies of the remains were carried out both in 1985 and in 1993. Although the maxillary bone was in good condition and several teeth were preserved, neither study counted with the participation of a forensic odontologist. The objective of this work is to fill that gap, complementing the anthropological reports of the skull found in Antarctica in 1985 with a forensic odontology perspective. Methods: A morphological examination of the skull was carried out, with focus on the maxillary bone and teeth. A photographic record of the remains was made. Results: At the time of the dental examination, teeth 13, 14, 24 and 25 (FDI notation) were present. The premolar 15 and the molar 16 had been removed for DNA analysis. A supernumerary tooth was found within the container storing small pieces of bone detached from the skull. Previous anthropological analyses had failed to identify it as such. Socket 21 was notoriously smaller than expected, and the root of the supernumerary tooth matched perfectly into it. It is, therefore, highly probable that this supernumerary tooth occupied socket 21 during lifetime, making it a likely case of hypohyperdontia, an extremely rare condition in world population. This individualizing evidence, added to the information from the DNA study, could bring us even closer to an identification of the Antarctic human remains. Conclusion: In the study of human remains, multidisciplinary teamwork is essential to obtain the best results from the available information and material. Forensic odontology is a fundamental part of a forensic anthropological study, as it analyzes and assesses the individualizing characteristics of teeth, thus improving the changes of a successful identification.

Keywords: Forensic, Odontology, Identification, Antarctic

PP10 Composite restorations visualized by UV light

Author/s: Line Staun Larsen - 1,2, Jane Vestergaard Johansen – 1, Hannah Sophie Antonia Duncker – 1, Dorthe Arenholt Bindslev - 2
Institution Affiliation/s: 1 Department of Dentistry and Oral Health, 2) Department of Forensic Medicine, HEALTH, Aarhus University, Denmark
Presenting author contact e-mail: line.staun@dent.au.dk

Objective: The vast majority of dental restorations are made of composite materials. Impeccable restorations may be difficult to detect and thus pose a critical problem during forensic odontology identification. Exposure to specific wavelengths of UV light have been suggested to be a useful tool to detect composite restorations due to different emission of UV light from restorations compared with enamel and dentin. The technique seems promising. The aim of this study was to explore whether dental composite restorations could be detected using a portable 385 nm UV light source. A secondary aim was to explore to which extend the surrounding lighting conditions influenced the detection. Methods: A single-surface composite restoration was prepared in each of 52 extracted human molars. The composites comprised 14 different brands encompassing 24 shades. Using a digital camera, all ventral and lingual surfaces were photographed (in total 104 surfaces) in a room with normal lighting and a room with dim lighting (n=2x104) while exposed to UV light, 385 nm. The digital photographs were assessed in random by two experienced forensic odontologists for detection of restorations. Results: All restored surfaces (n=2x52) were detected, no false positives. UV exposure in dim lighting markedly improved the distinction between tooth substance and dental composite restorations and thus facilitated the detection. Conclusions: All composite restorations were detected with the portable UV light source no matter the brand or shade. Optimizing the lighting conditions during UV-exposure, using dim lighting, supports the feasibility of the method. We recommend this simple device for clinical post mortem dental examination.

Keywords: forensic, dental, composite, UV light, detection
Sponsorship Acknowledgement: Thanks to Dansk Nordenta A/S and Plandent for providing information on the most popular dental composite materials in Denmark, and 3M, Dentsply Sirona, Kerr Corporation, Kuraray Co., Ltd., Micerium S.p.A., PULPDENT Corporation, Tokuyama Dental Deutschland GmbH, Ivoclar Vivadent Inc. and VOCO GmbH for donating composite materials for the study. Thanks to Multimedia designer Kim Sørensen, Department of Dentistry and Oral Health, Aarhus University, for expert photography guidance.

PP11 Police awareness of the need of primary identification methods

Author/s: Mari Metsaniitty -1, Tiia Gronberg -2, Jukka Palo -3
Institution Affiliation/s: 1 Forensic Medicine Unit, Forensic Odontology, Finnish Institute for Health and Welfare, 2 Homicide Investigation, DVI Unit National Bureau of Investigation, 3 Forensic Chemistry Unit, Forensic Genetics, Finnish Institute for Health and Welfare, Helsinki, Finland
Presenting author contact e-mail: mari.metsaniitty@thl.fi

In many western societies increasing amount of people live – and die –alone. The growing number of deaths occurring hidden from the eyes of others emphasizes the need of reliable identification of the deceased. In Finland, the police are in charge of the forensic cause of death investigation, of which identification is an inherent part. Reliable identification can be only achieved with dental, DNA or fingerprint comparisons, but these are not mandatory, if the police consider the identity as resolved by other means. The aim of this study was to assess the number of forensic autopsy cases in Finland where reliable identification was deemed necessary and dental identification possible but was not requested by the police. The assessment of identification need was performed by forensic pathologists and autopsy technicians during the year 2022. The total number of forensically autopsied bodies during the period was 8,099. Of these, 81 cases were recognized as such where identification with primary methods was necessary, but not requested. These deceased were decomposed (N=65), mummified (N=12), skeletonized (N=2), crushed (N=4), shot in the head or face (N=4), and/or otherwise decomposed or damaged. In absolute majority of these cases (N=71, 87.7%), dental identification would have been possible. Most of the deceased were found in the assumed person's home, but also from another apartment, terrain, or water. The identification performed by the police was based on ID card (N=29), visual identification by a third person (N=10), or information of the sole resident in the apartment (N=10). In 21 cases, the police were contacted by the autopsy personnel about the need of primary identification, which led to subsequent identification request in only five cases. This survey highlights the need of enhancing the awareness of primary identification methods among police officers involved in cause of death investigation.

Keywords: dental identification, DNA identification, forensic autopsy, police

PP12 How to compare dental findings between antemortem and postmortem radiographs for personal identification - eye tracking pilot study

Author/s: Maki Ohtani- 1, Shoken Suzuki- 1, Yuhei Matsuo- 1, Sohtaro Mimasaka- 1
Institution Affiliation/s: 1 Department of Forensic Sciences, Akita University Graduate School of Medicine, Akita City, Japan
Presenting author contact e-mail: mohtani@doc.med.akita-u.ac.jp

Objective: The most common type of antemortem (AM) information for personal identification using dental methods is dental radiographs in our department. To investigate how to compare dental findings between AM and postmortem (PM) radiographs, we attempted to analyze eye movement using eye-tracking technology. Methods: The subjects were 58 cases identified using the main supporting evidence from AM and PM panoramic radiograph comparisons between 2014-2018 at Akita University. We recorded the eye movements of a forensic odontologist when comparing AM and PM panoramic radiographs using Tobii Pro Nano and Tobii Pro Lab (Tobii, Stockholm, Sweden). We calculated the interval duration for each pair of radiographs, and compared heat maps of visual fixation and gaze plots in the longer duration cases with those in the shorter cases. Results: Gaze plots showed that fixation points moved up and down between AM and PM radiographs. The mean interval duration was 18.34 seconds (5.72- 47.88 seconds). Heat maps and gaze plots in the longer duration cases showed that almost all teeth were compared, but those in the shorter duration cases showed that only some characteristic points were observed. The longer ones were cases in which many teeth were treated after the AM radiographs were taken, or cases in which X-ray projection angles were much different between AM and PM radiographs. The shorter ones had distinct characteristic findings such as dental implants and impacted third molars. Conclusions: Eye tracking records showed that the examiner searched each characteristic on one radiograph and then compared it to the similar finding on the other radiograph. The difficult aspect of interpreting the fixation was that the eye movement stopped not only at the characteristic findings but also at findings difficult to compare. We need more records from dentists with different experiences to interpret how to compare dental findings.

Keywords: eye tracking, panoramic radiographs, dental comparison, human identification

PP13 Estimation of postmortem interval through histological analysis of buried teeth - preliminary results

Author/s: Gabriel Fernandes Chaves Arantes de Carvalho Gomes -1, Cindy Maki Sato -1, Victor Jacometti -1, Dimitrius Leonardo Pitol -1, Karina Fittipaldi Bombonato Prado -1, Joao Paulo Mardegan Issa -1, Ricardo Henrique Alves da Silva -1
Institution Affiliation/s: 1- School of Dentistry of Ribeirao Preto, University of Sao Paulo, Brazil
Presenting author contact e-mail: gabrielgomes@politec.mt.gov.br

The postmortem interval (PMI) estimates the time between death and finding the body. The inorganic composition of the teeth attributes the characteristic of perenniality to the dental element and can remain intact in forensic archaeological situations. This research aimed to verify the possibility of estimating PMI through histological analysis of buried dental tissues, simulating the usual conditions of forensic practice. Fifty teeth were obtained and divided into three groups: control (T0), one month (T1), and three months (T2). The control sample at T0 consisted of 10 teeth, and the other groups (T1 and T2) were divided into two subgroups each: control and buried, totaling the remaining 40 teeth. Preliminary results showed that up to three months, pulp and pre-dentin were still present in some samples, the cementum showed partial resorption, and the periodontal ligament was completely absent. In conclusion, it is possible to estimate the minimum PMI of three months in buried teeth through qualitative histological parameters, as well as the absence of the periodontal ligament and the partial resorption of cementum, and the pattern of decomposition in buried teeth is more advanced when compared to the controlled environment.

Keywords: forensic sciences, forensic dentistry, histology
Sponsorship Acknowledgement: Coordenacao de Aperfeicoamento de Pessoal de Nivel Superior - Number 001

PP14 Analysis of oral cavity and teeth profile findings for identification in cases of drowning victims: a case report

Author/s: Eko Prastyo-1,2, Nurtami Soedarsono-1, Mindya Yuniastuti-1, Elza Ibrahim Auerkari-1, A. Winoto Suhartono-1, Ade Firmansyah Sugiharto-3, Oktavinda Safitry-3

Institution Affiliation/s: 1 Department of Oral Biology-Forensic Odontology Specialist Study Program, Faculty of Dentistry, Universitas Indonesia, 2 Department of Forensic Odontology & Medicolegal, Faculty of Dentistry, Institut Ilmu Kesehatan Bhakti Wiyata Kediri, Indonesia, 3 Department of Forensic Medicine & Medicolegal Studies, Faculty of Medicine, Universitas Indonesia, Indonesia

Presenting author contact e-mail: eko.prastyo72@gmail.com

Forensic odontology is a science that focuses on the analysis of the characteristics of the oral cavity and teeth used for identification purposes in a medicolegal context. Identification in forensic odontology can be primary and secondary. Primary identification can be obtained from the morphological characteristics of the unique and individual teeth, while secondary identification from the oral cavity area can be obtained through typical findings such as accessories attached to the victim's oral cavity area. In this case report, we report the finding of the body of an unidentified male who died from drowning in a river. From the results of the dental autopsy examination of the victim, it was found that there were shovel shapes on the maxillary central incisors, teeth with peg-shaped anomalies on the maxillary lateral incisors, pink teeth phenomenon in the mandibular anterior teeth. In addition, accessories were found in the form of a tongue piercing at the tip of the tongue. The conclusion of this case report is that these findings can be used as primary and secondary identification tools for victims without an identity.

Keywords: forensic odontology, drowning, identification

PP15 Forensic odontology in human identification

Author/s: Ammar Teboul, Samia Mouffok
Institution Affiliation/s: National Institute of Criminalistics and Criminology, Algiers, Algeria
Presenting author contact e-mail: ammarsamiaanthropo@gmail.com

Forensic odontology is considered one of the few reliable approaches for human identification during investigations related to the discovery of mummies, carbonized human remains, and skeletons or during mass disasters. This discipline, that uses constructive and comparison identification is complementary to forensic anthropology, and vital to forensic investigations and human identification during disasters, especially in countries affected by earthquakes, such as Algeria. Forensic odontology provides rapid and economical means of victim identification, taking profit of the high resistance of teeth to biotic and abiotic agents except very high temperatures and strong acids. The work of the forensic odontologist focuses primarily on the analysis of human teeth and bite marks. Laboratory analysis includes the use of regionally validated methods for sex and age estimation, comparison of ante-mortem data of the individual to the postmortem evidence to establish a positive identification, and bite mark comparison. Forensic odontology provides useful information to complement forensic anthropology through the identification of the deceased and reconstruction of the crime scenario and, therefore, provides the court with the necessary technical elements to render judgment.

Keywords: Human identification, forensic odontology

PP16 Age and sex determination in an archaeological sample in Croatia

Author/s: Marina Marić -1, Dinko Radić -2, Jelena Dumančić -1, Marin Vodanović -1, Davorka Radovčić -3, Minja Birimiša -1, Hrvoje Brkić -1
Institution Affiliation/s: 1School of Dental Medicine, University of Zagreb, 2 Vela Luka Cultural Centre, 3 Croatian Natural History Museum, Zagreb, Croatia
Presenting author contact e-mail: marina.maric@tel.net.ba

OBJECTIVE: The aim is to determine the age and sex on the skeletal remains of permanent teeth and jaws in an archaeological sample from the Kopila necropolis on the Island of Korcula, Croatia, from the period of the Late Iron Age, for the purpose of a demographic analysis of the population. MATERIALS AND METHODS: Skeletal remains found in tombs 3 and 4 of the western nucleus of the necropolis were used in the analysis. Due to the poor preservation of the sample and with the aim of protecting a valuable archaeological find, non-destructive methods of determining the age and sex of the individuals were used. After determining the minimum number of individuals and dividing them into individuals according to the morphological characteristics of the teeth, the age was determined by the analysis of tooth wear using the Lovejoy method, and the sex was determined by the morphological and odontometric characteristics of the teeth and parts of the jaw. RESULTS: In a tomb no. 3, 7 males were found. There are 3 individuals under the age of 20, 1 individual each aged 24-30 y., 35-40 y., and 45-55 y., and for 1 individual it was not possible to determine the age. In a tomb no. 4, 32 individuals were found, of which 15 were male and 9 female, and for 8 individuals it was not possible to determine the sex. Under the age of 20, there were 2 individuals, 20-24 y. n=5, 24-30 y. n=3, 30-35 y. n=3, 35-40 y. n=6, and 11 individuals over 40 years. It was not possible to determine the age of the 2 individuals. CONCLUSION: The average lifespan of the inhabitants of Kopila Hillfort was 30-45 y. and corresponds to the average life expectancy of the Late Iron Age period

Keywords: age determination, sex determination
Sponsorship Acknowledgement: This research was funded by the Croatian Science Foundation within the project: IP-2020–02-9423 — Analysis of teeth in forensic and archaeological research

SOCIAL EVENTS

WEDNESDAY September 6, 2023

20.30 – 22.00h Welcome reception - Sponza Palace, Dubrovnik Old Town

THURSDAY September 7, 2023

17.00 – 17.15h All together photo, in the Arboretum of the University of Dubrovnik

20.30 – 22.00h Dubrovnik Old Town tour, meeting point Pile Gate

FRIDAY September 8, 2023

20.30 – 22.30h Congress dinner - cruise on the ship Karaka from the "Game of Thrones" (optional)

SATURDAY September 9, 2023

09.00 – 17.30h Sightseeing trip to Pelješac peninsula (optional)

NAKLADA SLAP

CONCORDA tourist agency

is partner in organizing congresses, conferences, symposium, conferences, seminars, business meetings, business and insentive travels.


9 789537 781187