



Abstract Book

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7: COMPARISON OF THE AERODYNAMIC CHARACTERISTICS OF THE UPPER AIRWAY BETWEEN CHINESE AND DUTCH OBSTRUCTIVE SLEEP APNEA PATIENTS

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Aims: The primary aim is to compare the aerodynamic characteristics of the upper airway, such as airway resistance (R) between Chinese and Dutch OSA patients.

Methods: In China, the participants were recruited from the sleep center of dental school of Shandong University. In The Netherlands, the participants were recruited from OLVG in Amsterdam. The diagnosis of OSA patients was based on an overnight polysomnographic recording. NewTom5G cone beam computed tomography (CBCT) scans were obtained from both Chinese and Dutch OSA patients. Computational models of the oropharynx were reconstructed based on CBCT images. The aerodynamic characteristics of the oropharynx were calculated based on these computational models.

Results: A total of 27 Dutch adults (mean age $\pm$ SD of 46.0 ± 14.1 years, body mass index [BMI] of 26.8 ± 3.5 kg/m², and apnea-hypopnea index [AHI] of 15.8 ± 7.2 events/h) and 24 Chinese adults (age 41.5 ± 13.0 years, BMI 26.8 ± 3.5 kg/m², and AHI 16.8 ± 8.0 events/h). There were no significant differences in AHI, age, BMI, and sex between the two groups ($P = 0.18-0.99$). There was no significant difference in the aerodynamic characteristics of the upper airway of both groups was not significantly different ($P = 0.16-0.96$).

Conclusion: Within the limitations of this study, no significant difference was found in the aerodynamic characteristics of the upper airway between Dutch and Chinese patients with mild to moderate OSA. The race plays similar role in the aerodynamic characteristics of the upper airway between Dutch and Chinese OSA patients.

10: CORRELATION BETWEEN THE MASTICATORY MUSCLE DIMENSIONS AND INTERNAL DERANGEMENT OF TEMPOROMANDIBULAR JOINTS BASED ON MAGNETIC RESONANCE IMAGING

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Background: The Internal derangement (ID) is one of the most prevalent causes of TMDs, and disc displacement is recognized as the most common ID. The masticatory muscles are among the anatomical structures involved in TMDs that may be affected by ID.

Aim: evaluate the correlation between the masticatory muscle dimensions and ID of TMJ using MRI.

Methods: This study was conducted on the MRI of 145 patients. The patients were categorized into three groups of normal disc position (NP), disc displacement with reduction (DDR), and disc displacement without reduction (DDWR). The maximum dimensions of the masticatory muscles were measured for each of the groups. Data were analyzed using t-test, Pearson's correlation test, ANOVA test, and Tukey's test ($\alpha < 0.05$).

Results: Significant differences were observed between the NP, DDR, and DDWR groups regarding the height and length of the superior head of the lateral pterygoid muscle; both parameters were significantly higher in the NP group, followed by the DDR and DDWR groups. The dimensions of masticatory muscles were significantly greater in males than females, except for the width of the medial pterygoid muscle. The height of the masseter muscle and the medial pterygoid muscle ($r = 0.166$, $P = 0.046$) was significantly correlated with age.

Conclusion: Significant correlations were found between the height and length of the superior head of the lateral pterygoid muscle and ID of TMJ; the corresponding values were lower in the DDWR group compared to the DDR and NP groups, respectively.

14: PANORAMIC RADIOGRAPH AIRSPACE ERROR REDUCTION: A SIMPLE EFFICIENT TECHNIQUE FOR TECHNICIANS IN DENTAL OFFICE.

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Aim: Panoramic radiography is one of the most imaging modalities utilized among dental clinics. There are errors that affect image quality. One of the most prevalent errors is tongue positioning error. This can lead to repeated radiographs and increased cost and time. Until now, in the references books of maxillofacial radiology there is no specific method mentioned how to train the patient and how to solve this problem.

Materials and Methods: To avoid this error –prone situation the patient should be asked to position their tongue so that it adheres to the palate.(roof of the mouth).In this method, the patient asked to place listerine cool mint breath strips on the middle part of the tongue (dorsal side) and then stick it to the roof of the mouth and hold the tongue up until the end of the radiography process.

Results: The method is simple and practical , using of it reduces misunderstanding of instructions that given by practitioner, also these mint strips dissolve immediately in the mouth and therefore the possibility of aspiration will be zero .In the end fresh breath of mouth is the result of using these mint strips. The image obtained after using this method will be very clear and free of any error caused by the shadow of the airway space.

16: THE ADDED EFFECT OF ARTIFACT REDUCTION ALGORITHM AND ULTRA-LOW DOSE PROTOCOLS ON THE ACCURACY OF MEASUREMENTS OBTAINED USING PLANMECA VISO G7 CBCT

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Background: Cone Beam Computed Tomography became one of the most radiographic modalities used in dental practice, reduction of patient dose and enhance image quality are mandatory issue. The aim of this study is to evaluate the accuracy of linear and volumetric measurements using Planmeca Viso G7 CBCT examinations acquired with ultra low dose and metal artifact reduction protocols.

Methods: Eight metallic spherical objects different in size with pre scanning diameter measurements using calibrated digital caliper was fixed on a five dry human mandible, the real physical diameters and linear measurements between metallic objects was measured. A CBCT acquisition was obtained four times with same proper field of view, 150 μ m and 100 Kv in four scans using Planmeca[®] Viso G7 CBCT machine acquisition was done with and without artifact reduction protocol, ultra-low dose protocol both acquisition protocols are inherited option in Planmeca[®] Viso G7 CBCT machine. All images were interpreted with the Planmeca Romexis[®] software.

Results: Linear and volumetric measurements were found with non-statistically significant difference with real measurements in the acquisition with ARA and ULD, but with a statically significant difference with other three acquisition sequences.

Conclusions: Using the artifact reduction algorithm in combination with ultra-low dose as acquisition tool in the CBCT machine resulting an accurate linear and volumetric measurements, enhance image quality, reduce metallic artifact with lowest radiation dose.

17: RADIOLOGICAL EVALUATION OF PERMANENT TEETH OF CHILDREN FOR TREATMENT PLANNING

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Aim: To propose the protocol for following step-by step for the right choice of the treatment method for the permanent teeth with open or closed root apex after the clinical and radiological examination.

Material and Methods: Basic knowledge about the root development stage due to the age, radiographs in dentistry, the radiological appearances of the permanent teeth in children, caries, periapical bone and the treatment methods for pulp and root canal system were discussed with dentist working in field of oral radiology, specialists in pediatric dentistry, endodontist, and general dental practitioner. The clinical expertise and attitudes with regards to different treatment methods of pulp and root canal system in permanent tooth were discussed among specialists. During the protocol development several meetings were held to clarify the structure of the protocol.

Results: Protocol was structured in main steps/sections: Patient complaints, Clinical examination, Radiographic examination, Radiological evaluation of Dental anatomy, Radiological evaluation of Dental pathology and Treatment planning. The sections of Radiological evaluation of Dental anatomy and Treatment planning were split to the subsections: Teeth with open apices and Teeth with closed apices. Treatment methods for the teeth with open or closed apices are listed and linked.

Conclusion: Protocol is designed as a scheme that can be easily used by the general dental practitioner, pediatric dentist or endodontist to follow it step-by-step to evaluate the permanent teeth with open or closed root apex and to choose the treatment method for the children in daily practice.

18: UNVEILING OROPHARYNGEAL AIRWAY CHARACTERISTICS IN ORAL SUBMUCOUS FIBROSIS : A CROSS-SECTIONAL STUDY EMPLOYING THREE-DIMENSIONAL VOLUMETRIC ANALYSIS

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Aim: Oropharyngeal airway is compromised in Oral Submucous Fibrosis (OSMF) patients resulting from submucosal fibrosis involving the faucillar pillars, pharynx and the pyriform fossae. An assessment and correlation of oropharyngeal airway space dimensions in varying stages of OSMF patients based on semiautomatic segmentation of DICOM data obtained from CBCT volumetric scans could assist surgeon's assessment prior to surgical procedures.

Materials and Methods: Patients were categorized into varying groups as per the OSMF clinical staging criteria according to Haider et al. CBCT data sets for volumetric airway assessment were obtained for the cases. For the semi-automatic segmentation process, image segmentation was performed using ITK-SNAP, employing an interactive threshold technique assisted by a region-growing algorithm. The assessment of intra- and inter-examiner variability was conducted using Bland-Altman analysis. The data were subjected to further statistical analysis like ANOVA correlation tests and Regression analysis were performed on the data.

Results: Concerning interrater variability, the Bland-Altman- Analysis showed that there were no variations between the estimation of pharyngeal volumes by the examiners. Data analysis showed significant decreasing volumes of airway with increasing severity grades of OSMF.

Conclusion: A novel method of approximating the pharyngeal airway volume can be advocated using data obtained from CBCT scans of OSMF patients This can provide us with a noninvasive tool for pre-anesthetic evaluation and also for estimation of risks of obstructive sleep apneas in OSMF patients.

21: DETECTION OF CARIES LESIONS USING A WATER-SENSITIVE STIR SEQUENCE IN DENTAL MRI

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Aim: In clinical practice, diagnosis of suspected carious lesions is verified by using conventional dental radiography (DR), including panoramic radiography (OPT), bitewing imaging, and dental X-ray. The aim of this study was to evaluate the use of magnetic resonance imaging (MRI) for caries visualization.

Material and Methods: Fourteen patients with clinically suspected carious lesions, verified by standardized dental examination including DR and OPT, were imaged with 3D isotropic T2-weighted STIR (short tau inversion recovery) and T1 FFE Black bone sequences. Intensities of dental caries, hard tissue and pulp were measured and calculated as aSNR (apparent signal to noise ratio) and aHTMCNR (apparent hard tissue to muscle contrast to noise ratio) in both sequences. Imaging findings were then correlated to clinical examination results.

Results: In STIR as well as in T1 FFE black bone images, aSNR and aHTMCNR was significantly higher in carious lesions than in healthy hard tissue ($p < 0.001$). Using water-sensitive STIR sequence allowed for detecting significantly lower aSNR and aHTMCNR in carious teeth compared to healthy teeth ($p = 0.01$).

Conclusion: The use of MRI for the detection of caries is a promising imaging technique that may complement clinical exams and traditional imaging.

23: FEASIBILITY OF FROZEN SOFT TISSUES TO SIMULATE FRESH SOFT TISSUE CONDITIONS IN FOUR CONE BEAM COMPUTED TOMOGRAPHY (CBCT) UNITS

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Aim: To assess and compare the feasibility of using frozen soft tissues to simulate fresh soft tissues in pig mandibles across four cone beam computed tomography (CBCT) units.

Material and Methods: Two fresh pig mandibles with soft tissues, each containing two tubes filled with a radiopaque homogeneous solution, were scanned using two field-of-view sizes and four CBCT units: 3D Accuitomo 170 (Morita, Kyoto, Japan), Axeos (Dentsply Sirona, Charlotte, North Carolina, USA), ProMax 3D Max (Planmeca, Helsinki, Finland), and X800 (Morita). Subsequently, the pig mandibles were deep-frozen and scanned again. Three cross sections were exported from each CBCT volume and grouped into pairs, with one cross-section representing a fresh mandible and the other a frozen mandible. Three radiologists compared the pairs and assigned scores to assess the relative image quality using a 5-point scale. Mean gray values and standard deviation were obtained from homogeneous areas in the tubes and subjected to Pearson correlation analysis between fresh and frozen physical states per CBCT unit.

Results: All CBCT units revealed similarity of the CBCT image quality between fresh and frozen states. In general, the distribution of mean gray values and noise was similar between fresh and frozen states irrespective of the CBCT unit. Mean gray values exhibited positive and strong correlations between fresh and frozen states. Additionally, in general, noise values exhibited positive and moderate correlations.

Conclusion: The freezing of pig mandibles with soft tissues may serve as a method to extend their usability and durability, regardless of the CBCT unit.

25: NEURAL DEFORMABLE CBCT

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Objectives: To use neural deformable radiance fields for marker-free motion correction in CBCT

Material and Methods: in 2021 Mildenhall et al. [1] proposed a framework for synthesizing novel views of complex scenes by optimizing an underlying continuous function from few input images. Using this technology, we developed a motion correction and reconstruction method combining inverse neural rendering and neural field deformation to enhance CBCT reconstruction. The method is capable to represent different motion patterns such as head movements, separate jaw motions and swallowing. It was evaluated using synthetic scenarios as well as real-patient images.

Results: Using the method termed «neural deformable CBCT» we achieved reconstructions of remarkable quality. The method also worked well in a motion deformed 4D-CBCT dataset of the lung.

Conclusions: The proposed framework produces high-quality 3D and 4D state-of-the-art reconstructions from motion-beset CBCT data.

26: QUALITATIVE AND QUANTITATIVE ANALYSIS OF THE MOST COMMON MINI-PLATES PLACEMENT SITES IN ADULT PATIENTS: A COMPARATIVE CROSS-SECTIONAL STUDY

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Aim: This study aimed to analyze the quality and quantity of the bone to recommend the most suitable miniplates placement sites of adults with normodivergent facial pattern of both genders.

Material and Methods: This retrospective cross-sectional comparative study retrieved and analyzed 60 CBCT scans of adult patients who fulfilled the selection criteria. The analysis included measurements of Cortical Bone Thickness (CBT) and Cortical Bone Density (CBD) at different levels in the most common position of miniplates: maxillary anterior (MA), infra-zygomatic (IZ), para-symphyseal (PS) and buccal ridge (BR).

Results: The CBT and CBD ranged 1.27-1.83 mm and 635-821 gray-scale (GS), 1.99-2.23 mm and 508-779 GS, 1.88 -2.74 mm and 1074-1307 GS, and 2.64-3.69 mm and 883-1181 GS for MA at 16 and 18 mm, IZ at 4 mm from root apex, PS at 8 and 12 mm, and BR at 8 and 10 mm, respectively. For gender comparison of the recommended sites, females showed significantly higher values of CBD of left IZ area, CBT in PS area, CBT in BR area, while males showed significantly higher values of CBT of the right MA area.

Conclusion: Within the limitations of this study, the recommended miniplate insertion sites for both males and females are at:

- 1- 16 and 18 mm from alveolar crest for the maxillary anterior miniplates.
- 2- 4 mm from maxillary first molars for infra-zygomatic miniplates.
- 3- 8 and 12 mm from alveolar crest for the para-symphyseal miniplates.
- 4- 8 and 10 mm from alveolar crest for the buccal ridge miniplates.

27: DENTAL MRI - A METHOD TO MONITOR PERIODONTAL EDEMA IN PATIENTS WITH PERIODONTAL DISEASE

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Aim: Periodontal disease can be visualized by using dental MRI. Hyperintense edema and bone loss correlate to the typical clinical findings periodontal pocket depth and bleeding on probing. Aim of this study was to investigate the reversibility of imaging findings through standard treatment in the timespan of 3 months in correlation to the clinical examination status, in order to determine whether MR imaging can be used to monitor disease activity.

Material and Methods: 36 patients with periodontitis were prospectively analyzed and received imaging with 3D isotropic T2-weighted STIR and Fast Field Echo T1-weighted Black bone sequences before and 3 months after non-surgical therapy. Bone edema depth was measured in 164 teeth before and after treatment. Results were compared with standardized clinical examinations according to the periodontal screening index (PSI).

Results: Periodontitis results in bone edema adjacent to affected teeth with an average depth of 1.8 ± 0.18 mm. 3 months after therapy, mean edema depth shrunk to 1.5 ± 0.14 mm, $p < .01$. Edema reduction was observed only in patients with bleeding on probing (BOP) before treatment (2.0 ± 0.21 mm vs. 1.7 ± 0.16 mm, $p < .01$), while there was no change in patients without BOP (0.71 ± 0.19 mm vs. 0.75 ± 0.21 mm). Changes were observed most prominently in patients with clinically measured periodontal pockets >5 mm depth (3.4 ± 0.36 mm vs. 2.4 ± 0.26 mm, $p \leq .001$).

Conclusion: Periodontal osseous edema in T2 STIR MR-imaging can be used to monitor inflammation in patients with periodontal disease. This provides additional information for therapy monitoring and could be useful to validate therapy methods.

28: DEEP LEARNING NETWORKS TOWARDS SEGMENTATION OF THE LOWER AND UPPER JAW

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Aim: In dental applications, AI solutions have mainly been proposed for CBCT or X-ray data. However, MRI does offer advantages like radiation-free imaging and a higher contrast within soft tissues. In order to establish automated segmentation of the bony structures in the upper and lower jaw deep learning methods were trained on MR data.

Methods: A stepwise approach was used: networks were trained to detect bony structures of the upper and lower jaw. Therefore MR data of the viscerocranium were segmented manually representing the ground truth. Based on these data different algorithms were trained to detect osseous structures. Second, we trained the networks to track the inferior alveolar nerve (IAN).

Results: 220 MR data were acquired with similar protocols (3D STIR and 3D Short T1 FFE sequences). STIR and T1 sequences had been coregistered. We generated labels of jaw bones in 51 MR data, 60 labels of the IAN in MR data. We trained networks with the labels of the bones and the course of the IAN in MR. Congruence of manually segmented data and the AI-labeled data was calculated (Dice coefficient).

Conclusion: Results show that it is possible to detect structures in MR data using deep learning networks. The established algorithm has the capability to label the upper and lower jaw on MR data correctly. Manual segmentation is time consuming so algorithms will be needed for further assessment of MR-imaging. Deep learning methods are capable to detect different structures in MR data.

29: DETECTION OF NERVE INJURY OF THE LINGUAL AND THE INFERIOR ALVEOLAR NERVE BY USING DENTAL MRI

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Aim: Dentoalveolar surgery can lead to mechanical injury of the lingual nerve (NL) or the inferior alveolar nerve (NAI). Nerve injuries might not be noticed intraoperatively, however they become apparent during follow-up examinations due to existing neurosensory deficits. Clinical neurosensory tests and neurophysiological examinations are used to determine the underlying type of lesion. In case of a complete interruption of continuity microneural reconstruction could be performed. Therefore reliable information about the extent of the injury are crucial.

Methods: MRI examinations for neurography were performed including specific high-resolution sequences (3D STIR, 3D DESS). MRI findings were further analyzed with neurosensory tests and correlated with intraoperative findings.

Results: In 15 patients with unilateral lesions of the sensory mandibular branches (NL n = 10; NAI n = 5), direct visualization of the affected nerves was possible. It was not possible to differentiate between axonal, endo- and perineurial lesions, i.e. lesions with preserved continuity (Sunderland I - IV). In contrast, a complete interruption of continuity and neuroma formation (Sunderland V & VI / Mackinnon-Dellon) could be reliably recognized, as the subsequent intraoperative correlation showed (NL n = 5 ; NAI n = 1).

Conclusion: Dental MRI allows neurographic visualization of NL and NAI lesions and can provide a basis for differentiating the extent of damage in the early phase after injury. As a consequence, MR imaging becomes a guide in the decision-making process between a wait-and-see approach versus surgical revision. MRI can change the management concept by shortening the time before surgical intervention.

32: ODONTOMA ASSOCIATED WITH UNERUPTED LOWER THIRD MOLAR IN AN YOUNG ADULT PATIENT – CASE REPORT

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Odontomas are malformations not neoplasms. It is considered to be a congenital development abnormality that causes proliferation of epithelial and mesenchymal cells, as well as completely differentiated tissues, in the tooth cavity.

Aim: Report an unusual case of unerupted lower third molar with simultaneous root malformation associated with an odontoma-like lesion.

Material and Methods: A 25-year-old Caucasian male patient sought care, due to discomfort at the posterior right mandible. Clinical extraoral examination did not detect facial asymmetry, although a slight enlargement was seen. Small FOV Cone Beam Computed Tomography (CBCT) of the region was performed. We could observe, that the third molar was unerupted, as well as the presence of a hyperdense mass with hypo/hyperdense fragments in the interior, surrounded by a well-defined hypodense halo. The lesion, measured approximately 17.62mm x 13.46mm in the vertical and horizontal directions, respectively. We could depict a modification in the mesial root format, and close contact with the inferior alveolar nerve canal. This indicates, a probable diagnosis of a compound odontoma.

Conclusions: Detailed and careful assessment in imaging exams, such as CBCT, should be considered for surgical planning. Information regarding size, exact location and relationship of the lesion with adjacent structures. The presence of asymptomatic odontomas, as occasional findings on imaging exams can lead to late diagnosis of the lesion. The correct diagnosis allows for greater chances of successful surgical interventions, avoiding complications, preservation of noble vascular-nervous structures, such as the mandibular canal, as well as an adequate healing process for the patient.

34: CROSSVIT VS. RESNET FOR RADIOGRAPHIC RADIOLUCENT JAW LESION CLASSIFICATION: A PRELIMINARY RESULT

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Aim: Frequently encountered radiolucent jaw lesions, such as dentigerous cyst (DC), radicular cyst (RC), odontogenic keratocyst (OKC), and ameloblastoma (AM), share common characteristics, including well-defined borders near tooth-bearing areas. In 2021, CrossViT was introduced as a novel deep-learning approach for image classification by combining multi-scale vision transformers (ViT) with cross-attention mechanisms for accurate classification. However, its application in dental radiographic classification remains unexplored. This preliminary study evaluates the CrossViT-15 and -18 against the ResNet models for classifying common radiolucent jaw lesions.

Material and Methods: We conducted a retrospective study involving 169 radiolucent jaw lesions (57 DCs, 43 RCs, 30 OKCs, and 39 AMs) observed in panoramic radiographs (OPGs). Three experienced oral radiologists provided annotations with consensus, with histological confirmation of each lesion. We implemented CrossViT-15, -18, ResNet-50, -101, and -152, with horizontal flip for data augmentation. A four-fold cross-validation approach was employed. The models' performance was assessed through accuracy, specificity, precision, recall (sensitivity), and F1-score metrics.

Results: CrossViT-18 achieved the highest average accuracy (72.81%), followed by ResNet-101 (72.20%), CrossViT-15 (71.01%), ResNet-152 (68.67%), and ResNet-50 (68.65%). CrossViT-15, -18, and ResNet-101 showed high specificity of over 90%. ResNet-101 precision was 73.04%, CrossViT-15 was 70.22%, with recall of CrossViT-15 at 70.94%, and CrossViT-18 of 69.37%. The F1-score was highest for CrossViT-15 (68.35%), followed by ResNet-101 (67.90%) and CrossViT-18 (67.87%).

Conclusion: CrossViT and ResNet-101 models demonstrated comparable performance in categorizing prevalent radiolucent lesions in OPGs. However, further exploration with a larger dataset is recommended to discern distinctive results among these models.

35: CONE BEAM CT IMAGING AS A GUIDING TOOL IN DIAGNOSING ODONTOGENIC PATHOLOGIES OF JAW

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Aim: This study aims to investigate the diagnostic precision of Cone Beam Computed Tomography (CBCT) in assessing various dento-facial pathologies.

Objectives: The objectives include analyzing CBCT's efficacy in identifying and characterizing conditions such as radicular cysts, ameloblastomas, dentigerous cysts, and odontogenic keratocysts. The aim is to provide empirical evidence supporting CBCT as a reliable imaging modality for preferable diagnosis in dento-facial pathology.

Material and Methods: CBCT technology was utilized to obtain high-resolution radiographic images of dento-facial pathologies, enabling radiographic diagnosis. Specific software or tools used for image analysis and interpretation were discussed. The methodology ensures the validity and reliability of study findings.

Results: The study presents comprehensive evaluation of radiographic findings in radicular cysts, ameloblastomas, dentigerous cysts, and odontogenic keratocysts. Detailed radiographic characteristics observed in each pathology type, including size, shape, location, extent, and associated features, were highlighted. Quantitative and qualitative analysis demonstrated CBCT's diagnostic precision in accurately identifying and delineating pathology extents.

Conclusion: The study underscores CBCT's enhanced diagnostic accuracy and clinical utility in dento-facial pathology assessment. CBCT provides superior visualization and detailed anatomical information, enabling informed treatment planning and patient management. Future research directions and advancements in CBCT technology are discussed to further improve diagnostic capabilities in dental pathology assessment.

36: DENTAL-DEDICATED MRI FOR ASSESSMENT OF LOWER THIRD MOLARS: A PILOT STUDY

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Aim: To compare dental-dedicated magnetic resonance imaging (ddMRI) to CBCT as an imaging modality for assessing mandibular third molars.

Material and Methods: Twelve patients with CBCT (X1, 3Shape, Copenhagen, Denmark; FOV 4x4 cm, resolution 0.15 mm) and ddMRI of one lower third molar were selected. ddMR images were acquired on a Magnetom Free.Max (Siemens Healthineers, Erlangen, Germany) using a dental-dedicated coil (Rapid-Biomedical, Rimpf, Germany), using two sequences (6x6 cm FOV, section thickness 2 mm): PD (TSE) sagittal and coronal sections (resolution 0.3 mm) and PD-FS (TSE) sagittal sections (resolution 0.4 mm). Two observers (experienced within dentomaxillofacial radiology) assessed the images regarding angulation of the third molar, number of roots, relation to the mandibular canal, presence/absence of cortication between tooth and canal, canal positioned within a root flex, compression of the canal lumen, and pathology of the second molar: bone loss and external resorption. The ddMR images were also assessed regarding visibility and position of the lingual nerve. Interobserver agreement (Kappa statistics), and agreement between CBCT and ddMRI (non-parametric tests) were assessed.

Results: Kappa values for CBCT were substantial to almost perfect (0.83-1.0), while they varied from moderate to almost perfect (0.56-1.0) for ddMRI, except for position of the lingual nerve (0.33). There was no significant difference in assessments on CBCT and ddMRI for both observers ($p > 0.05$ for all parameters).

Conclusion: ddMRI was comparable to CBCT regarding assessment of mandibular third molars. The visualization of the lingual nerve is an added value with ddMRI, however further education and training is needed.

39: A RETROSPECTIVE LONGITUDINAL ASSESSMENT OF ARTIFICIAL INTELLIGENCE-ASSISTED RADIOGRAPHIC PREDICTION OF LOWER THIRD MOLAR ERUPTION

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Aim: The primary aim of this study was to investigate the prediction of lower third molar eruption and its uprighting with the assistance of an artificial intelligence (AI) tool. The secondary aim was identifying the incidence of fully erupted lower third molars with hygienic cleansability.

Material and methods: 771 patients having two panoramic radiographs were recruited, where the first radiograph was acquired at 8-15 years of age (T1) and the second acquisition was between 16 and 23 years (T2). Angulations, level of development, available retromolar space, and level of eruption were recorded in all panoramic radiographs.

Results: The predictive model for third molar eruption could not be obtained as few teeth reached full eruption. However, uprighting model at T2 showed that in cases with sufficient retromolar space, an initial angulation of $< 32^\circ$ predicted uprighting. Full eruption was observed for 13.9% of the teeth, and only 1.7% showed hygienic cleansability.

Conclusion: The predictions model of third molar uprighting could act as a valuable aid for guiding a clinician with the decision-making process of extracting third molars which fail to erupt in an upright fashion. In addition, a low incidence of fully erupted molars with hygienic cleansability suggest that a clinician might opt for prophylactic extraction.

41: TEACH ME SOME RADIATION PHYSICS - LARGE LANGUAGE MODELS AS TEACHING ASSISTANTS IN ORAL RADIOLOGY

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Aim: To develop Large language models (LLM) that can serve as a personal teaching assistant fluent in the Norwegian language within the fields of radiation physics, biology, protection, and radiological technology. The model would give up-to-date knowledge on local radiation protection regulations and relevant clinical and technological aspects while enhancing students' comprehension and engagement with the material.

Materials and methods: We created a database of more than 6000 question/answer pairs relevant to the curriculum for dentist and dental hygienist students in Norway. Specially instructed LLMs were used for creating the data. We fine-tuned the Meta Llama 2 model, which was one of the most advanced open-source models with acceptable knowledge of the Norwegian language on this data. We also used the database as source for a retrieval-augmented generation (RAG) approach to align foundation models with the learning outcomes.

Results: None of the approaches has yet resulted in an acceptable outcome. Different approaches, challenges and shortcomings will be presented and discussed.

Conclusion: Further research on how to align models with the pedagogical and professional requirements is needed. The project is ongoing and efforts on further enhancement of fine-tuning and improvement of the RAG approach to align the models will be reported.

42: REDUCTION OF GHOST IMAGES OF CERVICAL VERTEBRAE ON VERTICAL DUAL-EXPOSURE PANORAMIC RADIOGRAPHY

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Aim: Diagnosis of the incisor region can be difficult on panoramic radiography (PR) because of overlapping ghost images of cervical vertebrae (CV). Therefore, the aim of this study was to reduce ghost images of CV using a vertical dual-exposure PR method. This method involves merging two PR images acquired from different X-ray tube heights.

Material and methods: A Veraview X800 (J. Morita Co., Kyoto, Japan) digital PR system and a human head phantom with CV were used. The PR exposure conditions were as follows: exposure time 17 s, tube voltage 80 kV, and tube current 5 mA.

The first PR image (designated as $PR_{0\text{ mm}}$) was taken in the normal position, and then the height of the X-ray focus was raised by h mm (h : 5, 10, 15, 20) and a second PR image (designated as $PR_{h\text{ mm}}$) was taken. The images $PR_{0\text{ mm}}$ and $PR_{h\text{ mm}}$ were then merged using a least squares method. The merged and subtracted images of $PR_{0+h\text{ mm}}$ were calculated the pixel value.

The standard deviation of a region of interest (ROI) covering the incisor region was calculated on the subtracted images.

Results: The standard deviation of the $PR_{0+h\text{ mm}}$ image ROI was lower than that of the $PR_{0\text{ mm}}$ image.

Conclusion: Our vertical dual-exposure PR method referred to as $PR_{0+h\text{ mm}}$ could reduce ghost images of CV in the incisor region.

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44: AN ALTERNATIVE RADIOGRAPHIC APPROACH USING COMBINED CBCT AND ULTRASONOGRAPHY FOR DIAGNOSIS OF LATE ONSET INFECTIONS BASED ON A CLINICAL CASE SERIES

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Aim: The aim of the present study is to present unusual late site infections after the surgical extraction of lower wisdom teeth. The cases presented were studied with both US and CBCT to help set the diagnosis.

Materials and methods: The patients presented with pericoronitis and had the lower wisdom teeth removed surgically with no immediate complications. few months after the surgery the patient presented with mild swelling in the region corresponding to the lower second and third molar. The patients had no other dental procedures done in the region. A CBCT without findings was performed. After the CBCT an ultrasonographic scan was performed so that no additional radiation was given to the patient and to study the soft tissues of the region. The ultrasonographic examination revealed inflammatory lesions that will be presented.

Results: The dataset for late onset infections will be presented from our clinic in a total of 2604 wisdom teeth. And all relative statistics and therapeutic protocols. The Ultrasonographic features of the cases studied with Ultrasound will be given and suggestions for patients postop follow up.

Conclusions: The dentists should be aware of the alternate possibilities they have on viewing various soft tissue lesions. Ultrasound is the first and easiest alternative but requires skills and good knowledge of the anatomy of the region as it is an interactive doctor patient exam.

45: DETERMINATION OF OPTIMAL TRAINING SET FOR U-NET CARIES RECOGNITION MODEL ESTABLISHMENT WITH CBCT IMAGES

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Aim: to investigate whether a proposed method can be used for determination of an optimal training set for U-net caries recognition.

Material and methods: the optimal training set was calculated using the Tests for One-Sample Sensitivity and Specificity module of PASS 15 based on the expected sensitivity, specificity, mean caries rate, along with $\alpha=0.05$, $\beta=0.1$, and a two-sided test of variance. By this method, an optimal training set containing 263 carious teeth was suggested. According to a ratio of 8:1:1 for the distribution of training set, validation set and test set, the initial training set comprised slices for 25 carious teeth, the second training set comprised slices for 50 carious teeth, the third training set comprised slices for 75 carious teeth, and so on until the data set reached 300 teeth with carious lesions. The U-Net was validated and tested in a similarly way. The trained model and three radiologists was employed for caries diagnosis in another group of images.

Results: The results show that the model performance is gradually enhanced as the carious teeth increased in the training set. When the carious teeth reached 250, the network reaches the optimal level of performance, with accuracy, sensitivity, specificity, F1-Score, Dice similarity coefficients, and intersection over union of 0.9929, 0.9307, 0.9989, 0.9590, 0.9435 and 0.9008, respectively. the U-Net performance stabilized after training with more than 250 teeth. The U-Net performed a better accuracy than dental radiologists for caries recognition.

Conclusion: The optimal number of images in the training set is predictable.

47: EFFECTIVENESS OF PERIAPICAL RADIOGRAPHY TRAINING KIT FOR DENTAL UNDERGRADUATES: A PRELIMINARY STUDY

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Rejected periapical radiographs among dental undergraduates are commonly caused by misplacement of the radiographic armamentarium. Proper positioning of the radiographic armamentarium through supervision by a dental radiographer is a way to improve radiographic taking among dental undergraduates. However, the number of trained staff to provide continuous training among dental students in radiographic taking is usually inadequate in most dental institutions, including UKM. To overcome this problem, a periapical radiography training kit (PRTK) is potentially useful as a self-directed learning aid to improve periapical radiographic skill among dental students. This study is aimed to determine the effectiveness of the PRTK and demonstration videos in radiographic taking among dental undergraduates. This type of study is an experimental (parallel group design) to compare the rejection rate between a group of students who are exposed to the radiography training kit (trial group) and a group of students who are not exposed to the intervention (control group). This study involved a convenient sampling of 10 students within the clinical year (Year 4 and Year 5) who had at least one rejected radiograph at undergraduates' polyclinics from March until July 2022. Results showed the mean rank of the radiograph rejection rate in the trial group was lesser than the control group, following the intervention period. In addition, there is a statistically significant difference between the means of radiograph rejection rate before and after exposure to the PRTK ($p\text{-value} < 0.05$). In conclusion, PRTK is an efficient tool to facilitate dental undergraduates in improving their radiographic skills.

50: INFLUENCE OF CBCT FILTERS AND CONTRAST ADJUSTMENTS ON PERI-IMPLANT BUCCAL BONE THICKNESS MEASUREMENT AND BLOOMING EXPRESSION

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Aim: To assess whether filter and contrast adjustments can improve the accuracy of CBCT in measuring the buccal bone thickness (BBT) adjacent to dental implants by reducing blooming artefacts.

Material and Methods: Homogeneous bone blocks with peri-implant BBT of 0.3 mm, 0.5 mm, and 1 mm were imaged (Orthophos SL, Sirona). Three dentists measured the BBT in 234 CBCT scans under different settings of contrast adjustments and 'Sharpen' filter activation; implant diameter was also measured to assess blooming artefact expression. The differences between tomographic and actual measurements were subjected to repeated measures ANOVA ($\alpha = 5\%$).

Results: The group with the thinnest BBT (0.3 mm) had the greatest deviation between tomographic and actual measurements ($79.9\% \pm 29.0\%$). Conversely, the 0.5 mm ($36.1\% \pm 38.4\%$) and 1 mm ($29.4\% \pm 12.3\%$) groups exhibited lower deviation ($p < 0.05$). 'Sharpen' filter activation resulted in lower deviation for implant diameter ($p < 0.05$) but did not influence BBT measurements ($p > 0.05$). BBT and implant diameter measurements were not influenced by the contrast settings used ($p > 0.05$).

Conclusion: Filter and contrast adjustments did not improve the accuracy of CBCT in measuring peri-implant BBT, while actual BBT influenced this task. Blooming artefacts were reduced using filter but not influenced by contrast adjustments.

54: IMPACT OF DOSE-LOWERING CBCT PROTOCOLS ON HEIGHT AND WIDTH MEASUREMENTS IN THE MANDIBLE – AN EX VIVO STUDY IN HUMAN CADAVERIC SPECIMENS

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Aim: To compare linear bone measurements for implant planning in the mandible based on low-dose(LD), standard(SR), and high resolution(HR) CBCT protocols.

Material and Methods: Forty-two posterior implant sites were scanned in three CBCT units (AXEOS, Dentsply-Sirona, Germany; X1, 3Shape, Denmark; and VISO, Planmeca, Finland) using three protocols (HR, SR, and LD), and supplemented with ultra-low dose (ULD) for VISO. Three observers measured the height from the top of the alveolar crest to the upper border of the mandibular canal in sagittal and coronal plane images (420 of each), and the width three mm from the alveolar crest in the coronal images. Paired t-tests were applied to test differences in height and width measurements among the various protocols.

Results: Overall, the linear measurements for the three protocols did not differ significantly using AXEOS or X1. However, one observer measured the width in X1 significantly larger for HR than for SR (0.11 mm, $p=0.04$) and for HR compared to LD (0.12 mm, $p=0.02$). For VISO, the height and width measurements in the coronal plane did not differ significantly among the four protocols. The height measurements in the sagittal plane differed for observer 1 (HR vs SR: 0.16 mm, $p=0.02$), observer 2 (HR vs ULD: -0.18 mm, $p=0.02$), and observer 3 (HR vs LD: 0.48 mm, $p=0.03$).

Conclusion: Dose-lowering protocols did not impact significantly on linear bone measurements for implant planning. A tendency to a difference between HR and the other protocols for the height measurements in sagittal images was disclosed for VISO.

55: ASSOCIATION BETWEEN CAROTID ARTERY CALCIFICATIONS ON PANORAMIC RADIOGRAPHS, PERIODONTITIS, AND SIGNS OF VASCULAR DISEASE IN ULTRASOUND EXAMINATION

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Background: Cardiovascular diseases (CVD) and periodontitis are highly prevalent global diseases. Panoramic radiographs (PR) are often used in dentistry. Carotid artery calcification (CAC) is a sign of CVD and can be detected in PR as an incidental finding. The aim of the study was to investigate if CAC on PR combined with periodontitis were associated with different characteristics in ultrasound (US) examinations, pointing at CVD.

Material and Methods: In total, 346 participants examined with PRs and for periodontal status in the Malmö Offspring Dental Study (MODS), were assessed for CAC on PR. The participants were stratified into four categories: 1) No CAC or periodontitis, 2) No CAC, but periodontitis 3) CAC, no periodontitis 4) combined CAC and periodontitis. All participants within MODS were examined with carotid US. Three characteristics of carotid plaque were determined by US; i) largest area of a plaque, ii) number of plaques, iii) lumen reduction. Comparisons were made between CAC with and without periodontitis and US findings.

Preliminary results: CAC category 3-4 on PR were significantly associated with a higher degree of findings in US, when compared to participants without CAC (category 1-2) ($P \leq 0.045$; Kruksal-Wallis-test after adjustment). The association was most pronounced for CAC on PR combined with periodontitis (category 4) ($P < 0.001$; dito).

Conclusion: The association was strong between CAC on PR and signs of CVD on US and increased when the patient had both periodontitis and CAC on PR. This new knowledge could be a future tool to identify patients at unknown cardiovascular risk.

58: DOES SUPPLEMENTAL INFORMATION FROM CONE BEAM CT CHANGE EXPECTED LONG-TERM PROGNOSIS FOR TEETH WITH EXTERNAL CERVICAL RESORPTION?

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Aim: To evaluate whether supplemental information from CBCT changes expected long-term prognosis for teeth with external cervical resorption (ECR) compared to intraoral images.

Materials and Methods: 194 patients (mean age 41.2 (range 13-81)) having 244 teeth with ECR were included. An initial expected long-term prognosis was established based on intraoral images (good/poor). Afterwards, the patients underwent CBCT, and the final expected long-term prognosis was decided. From the intraoral images and CBCT, ECR using Heithersay's classification system (H-class 1/2/3/4; higher number indicates more severe ECR) and pulp involvement (yes/no) was assessed. Descriptive statistics evaluated changes in expected long-term prognosis after CBCT.

Results: Based on CBCT, the expected long-term prognosis was assessed to be poor for 173 teeth and good for 71 teeth. The long-term prognosis changed in 31.1% of the teeth after CBCT; 2.0% changed from a poor to a good long-term prognosis, and 29% changed from a good to a poor long-term prognosis. In 81 (33.2%) teeth H-class increased, and in ten teeth H-class decreased in CBCT. In 70 (28.7%) teeth, there was a change from no pulp involvement to involvement of the pulp after CBCT; eight teeth changed in the opposite direction. H-class 4, pulp involvement, ECR in the oral 1/3 of the root seen in CBCT, more than two surface lesions significantly influenced a poor long-term prognosis ($p < 0.05$).

Conclusion: Supplemental information from CBCT changed expected long-term prognosis in almost one third of teeth with ECR. In most cases, the expected long-term prognosis changed from good to poor.

68: GLANDULAR ODONTOGENIC CYST OF THE MANDIBLE: CASE SERIES

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Aim: Glandular odontogenic cysts (GOC) are rare developmental odontogenic cysts. They are aggressive and predominately a radiographic finding, with a relatively high recurrence rate. The objective of this study is to document the radiographic features of five cases diagnosed histopathologically as GOC, and correlate them to common features reported in previous studies.

Materials and Methods: Five patients, of those imaged with cone beam CT (CBCT) in the Oral Radiology department at King Abdulaziz University Dental Hospital (from 2022 to 2023), were reported to have GOC.

Results: The reported five cases were all male patients with age range between (32-50) years old. All lesions were located in the mandible; three located anteriorly and two posteriorly. Two lesions crossed the midline. Two of the lesions were unilocular and three were multilocular. The septa were straight, long and at right angles to the outer border. The borders were well defined, corticated, with scalloping between the roots. The effects on the surroundings included, thinning of the buccal/lingual cortical plates, expansion, inferior displacement of the mandibular canal, displacement of the teeth, and one lesion also showed loss of the lamina dura and root resorption. Only one lesion showed perforation of the cortical borders.

Conclusion: GOC shows similar radiographic features with odontogenic keratocyst, ameloblastoma, lateral periodontal cyst, residual cyst and central giant cell granuloma. Therefore a careful histopathological examination and a long-term follow-up are required to confirm the diagnosis and rule out recurrences.

69: QUANTITATIVE EVALUATION OF PERI-IMPLANT TRABECULAR BONE AFTER PROSTHODONTIC LOADING: A RADIOMORPHOMETRIC ANALYSIS USING PANORAMIC RADIOGRAPHY

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Aim: To evaluate the structural changes in peri-implant alveolar bone three years after prosthodontic loading using panoramic radiography (PR).

Material and Methods: PR images of seventy-seven posterior implants (44 mandibular, 33 maxillary) taken three months after implant placement (group-1) and three years after prosthodontic loading (group-2) were included in the study. Two regions-of-interest (ROI) were selected from mesial and distal sides of each implant. Then, mesial and distal ROIs were divided to obtain three sub-ROIs (coronal, middle, and apical). A total of eight ROIs and sub-ROIs from each implant were used for fractal dimension (FD), lacunarity, and bone area fraction (BA/TA) measurements. The paired-samples t-test was used to compare the measurements between two groups ($p=0.05$).

Results: BA/TA of mandibular implants calculated three years after prosthodontic loading was significantly lower than that measured after implant placement ($p=0.014$). No difference was found between two groups regarding FD and lacunarity measurements ($p>0.05$). FD of mandibular implants at the coronal level ($p=0.022$) and FD of maxillary implants at the middle level decreased ($p=0.025$), whereas lacunarity of mandibular implants at the middle level increased ($p=0.025$) after prosthodontic loading. While BA/TA of maxillary implants at the coronal level was lower three years after prosthodontic loading ($p=0.034$), BA/TA at the apical level was higher than that calculated after implant placement ($p=0.016$). None of the other sub-ROIs revealed any difference ($p>0.05$).

Conclusion: BA/TA can be used to analyze structural changes in peri-implant bone after prosthodontic loading. Additionally, FD and lacunarity may also be useful in evaluating peri-implant bone.

70: NOVEL AI-BASED TOOL FOR PROSTHETIC CROWN SEGMENTATION SERVING AUTOMATED CBCT-IOS REGISTRATION IN CHALLENGING HIGH ARTIFACT SCENARIOS

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Aim: To validate a cloud-based platform trained for AI-driven segmentation of prosthetic crowns on cone-beam computed tomography (CBCT) and subsequent multimodal intraoral scan (IOS) registration in the presence of high artifact expression.

Material and methods: A dataset of 30 IOS & CBCT jaw scans, each containing a minimum of four prosthetic crowns, was compiled. Cotton rolls were placed between cheeks and teeth during CBCT acquisition to enhance soft tissue delineation. AI-automated (AA) segmentation of prosthetic crowns and IOS-CBCT registration were compared to their corresponding semi-automatic (SA) approach for each case. Quantitative assessment compared AA's median surface deviation (MSD) and root mean square (RMS) in crown segmentation and IOS registration to those of SA. Additionally, segmented crown STL files were voxel-wise analyzed for comparison between AA and SA. Furthermore, qualitative assessment of crown segmentation evaluated the need for refinement, while registration assessment scrutinized registered-IOS alignment with CBCT teeth and soft tissue contours. Ultimately, the study compared time efficiency and consistency of both methods.

Results: Quantitatively, AA excelled with a 90% DSC for crown segmentation and an MSD of 0.04 ± 0.03 mm for CBCT-IOS registration, while also achieving 91% perfect matching of teeth and gingiva on CBCT, surpassing SA's 80%. Furthermore, AA was significantly faster than SA in both segmentation (200 times) and registration (4.5 times) and demonstrated excellent consistency (Intraclass correlation coefficient: segmentation=0.99, registration=1).

Conclusion: The novel cloud-based platform demonstrated accurate, consistent, and time-efficient prosthetic crown segmentation, as well as IOS-CBCT registration in clinical scenarios with high artifact expression.

71: THREE-DIMENSIONAL FACIAL IMAGING: A QUALITATIVE ANALYSIS OF FACIAL SCANNERS

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Aim: To qualitatively assess the perceptions of medical professionals and non-professional observers in terms of similarity and clinical applicability of facial scanning machines based on the principles of stereophotogrammetry and structured light.

Material and Methods: Facial images of 20 subjects (12 females and 8 males) were obtained using a professional camera (Nikon D800) and facial scanners (Vectra H1, RAYFace RFS200, and iReal 2E). Subjects rated the Overall Similarity Score (OSS), as well as the comfort, while practitioners measured the time and rated the user-friendliness of each scanner. The Instant Similarity Score (ISR) and Similarity Score (SS) were evaluated by seven professionals and six non-professionals, with a reliability assessment conducted. The machines were coded as: A (Vectra H1), B (RAYFace RFS200), C (iReal 2E).

Results: Scanner A had the best ISR, followed by scanners B and C ($p < 0.05$). All scanners showed good OSS without statistically significant difference. Strong intra-observer (72.9) and inter-observer (78.8) agreements were recorded. Scanner B had the fastest total scanning time, while Scanners A and C took the same amount of time. The retake rates for Scanners A, B, and C were 10%, 15%, and 35%, respectively. The comfort and user-friendliness of all machines ranged from moderate to good.

Conclusion: All scanners showed good performance and suitability for clinical use with varying pros and cons. Professionals and non-professionals had similar perceptions on similarity, without scanner preference noted for subjects. Clinicians should consider machine capabilities alongside time, retake rates, user-friendliness, and patient comfort to optimally balance clinical needs.

73: RADIOLOGICAL FINDINGS OF PRIMARY NON-HODGKIN'S LYMPHOMAS OF THE JAWS. A REVIEW OF 8 CASES

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Aims: The purpose of this study was to analyze the radiological findings of 8 patients, ignorant of their disease, who were referred for Cone Beam CT (CBCT), exhibiting common dental signs and symptoms and their histological diagnosis was Non-Hodgkin's Lymphoma (NHL).

Material and methods: In this study, 8 patients with a final diagnosis of malignant NHL were included. They were referred for CBCT of either maxilla or mandible and their medical history and chief complaints were recorded. In all patients biopsy of the tumors was performed and histopathological or immunohistochemical examinations lead to the final diagnosis of NHL.

Results: Most of the patients had a free medical history and their main chief complaints were: Hypoesthesia, teeth mobility and facial swelling. Maxilla was involved in 3 cases and mandible in 5. All lesions were osteolytic with ill-defined or moth-eaten borders and cortical erosion, infiltration or destruction was observed in all patients. In two patients, 2 small lesions were observed in the same area of the mandible, while a single larger lesion was detected in the other cases. Involvement of inferior dental canal was found in all patients with mandibular lesions and maxillary sinus or nasal cavity was involved in all cases of the maxilla.

Conclusions: Primary NHLs of the jaws are rare, but when they occur, they exhibit common dental signs and symptoms. The radiological findings are much similar of those of malignancy and the clinician should be aware in order to formulate a correct differential diagnosis.

74: ULTRA-HIGH FREQUENCY ULTRASOUND OF MINOR SALIVARY GLANDS CORRELATES WITH ACR/EULAR CRITERIA: DATA FROM A COHORT OF SJÖGREN PATIENTS

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Aim: To assess the correspondence between minor salivary glands ultra-high frequency ultrasonography and the criteria for primary Sjögren's syndrome (pSS) diagnosis established by the American College of Rheumatologists/European League Against Rheumatism (ACR/EULAR).

Material and Methods: Patients with a confirmed diagnosis of pSS were enrolled. Diagnosis was performed through rheumatologic assessment, glandular functional tests, blood testing for anti-Ro(SSA) antibodies, conventional ultrasonography of major salivary glands, ultra-high frequency ultrasonography (70 MHz) of minor salivary glands, and minor salivary glands biopsy for the assessment of Focus Score. Ultrasound scans of major and minor salivary glands were evaluated with the Outcome Measures in Rheumatology (OMERACT) scoring system, classifying glandular echostructure from normal (score 0) to absence of normal glandular parenchyma with glandular fibrosis and diffuse hypoechoic areas (score 3).

Results: In total 268 patients (91.8% females, mean age 55.07 years, SD 13.86) were enrolled. Minor salivary glands ultrasonography showed positive correlation with histology, positive anti-Ro(SSA) antibodies and unstimulated salivary flow rate. Minor salivary glands alteration on ultrasonography corresponded to pSS diagnosis according to ACR/EULAR criteria ($p < 0.05$). The estimated sensitivity for OMERACT scoring system of minor salivary glands was 97.3%, while the specificity was 90.8%.

Conclusion: Minor salivary glands ultrasonography could improve the diagnostic performance in pSS patients and is a predictor for Focus Score estimation and antibodies positivity. The high correspondence with histology gives insight on a rethinking of the necessity to perform minor salivary gland biopsy routinely and holds the promise to integrate and improve pSS evaluation and diagnostic work-up.

75: THE RADIATION DOSE IN THE CONE BEAM COMPUTED TOMOGRAPHY EVALUATION OF MAXILLARY IMPACTED CANINES IN PEDIATRIC PATIENTS

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The Aim: The aim of the study is to investigate the effect of radiation dose from different imaging protocols on the visualization of maxillary impacted canine teeth in 10 and 15-year-old patients using cone beam computed tomography.

Material and Methods: PCXMX 2.0 software was utilized to calculate organ absorbed doses. Images were simulated in 360 degrees using Newtom7G and Newtom GO devices with 8X6 cm² FOV in best, regular, and low resolution modes.

Results: It has been observed that the total absorbed organ dose is highest in images taken in the best mode of Newtom 7G, followed by regular and low modes. When comparing the total absorbed organ dose between the two devices, the highest value belongs to the best mode of Newtom 7G, while the lowest is associated with the low mode of Newtom GO. The most affected tissues are oral mucosa and salivary glands.

Conclusion: It has been observed that patients aged 10 receive a higher radiation dose in total absorbed radiation doses compared to those aged 15. When comparing radiation doses from images obtained in all modes of the two devices, Newtom 7G is found to cause more radiation exposure in tissues than Newtom GO. Oral mucosa is identified as the most affected tissue in terms of radiation exposure.

76: ACCURACY OF MRI-DERIVED VIRTUAL 3D BONE MODELS & CLINICAL FEASIBILITY IN MRI-BASED GUIDED IMPLANT SURGERY

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Aim: To investigate the accuracy of 3D bone surface models derived from MRI against CT and CBCT benchmarks, and to assess if MRI-based guided implant surgery is feasible in a clinical pilot study.

Material and Methods: The first study utilized porcine mandibles, comparing MRI, CT, and CBCT derived models against optical scans (reference) for geometric accuracy. The second study involved a clinical pilot with 12 patients undergoing MRI-based virtual planning and guided implant surgery, assessing deviations between planned and actual implant positions.

Results: MRI-derived 3D bone models demonstrated comparable geometric accuracy to CT and CBCT. All modalities were within a ± 0.3 mm equivalence margin, confirming their consistency and reliability. The clinical implementation of MRI-based guided implant surgery indicated acceptable deviations between planned and resulting implant positions (entry point error 0.8 ± 0.3 mm, apex error 1.2 ± 0.6 mm, angular deviation $4.9 \pm 3.6^\circ$), as well as effective visualization of relevant anatomical structures.

Conclusion: MRI technology presents a reliable alternative to CT and CBCT for computer-assisted maxillofacial surgery, and MRI-based guided implant surgery is a feasible and accurate procedure that avoids exposure to ionizing radiation.

81: A REVIEW OF THE USE OF CONTRASTING CASES TO SUPPORT NONANALYTIC LEARNING, AND CALIBRATION OF THIS APPROACH IN ORAL RADIOLOGY IN DENTAL EDUCATION

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Aim: Case comparison is a nonanalytic active learning approach that involves presenting students with multiple cases of the same phenomenon. The cases usually share a common deep structure but vary superficially. Students can be instructed to 'compare and contrast' cases or to use these cases in order to invent a general understanding. The aim of this project was to review literature available on contrasting cases as a learning strategy, and to calibrate and apply this technique to oral radiology.

Materials and Methods: A literature search was conducted using PubMed, APA PsycInfo, ScienceDirect, and Springer in order to find studies on learning through case comparison or contrasting cases, analogical processing, and schema induction. This information was then utilized to create learning materials for teaching oral radiology using contrasting cases, and was calibrated with five second-year dental students.

Results: Seven relevant papers were found on the topic of contrasting cases. A variety of instructional methods have been used. Students have been instructed to 'compare and contrast' the cases or invent a general solution that applies across the different cases. It has been found that inventing a general explanation for different cases of a disease elicits a deeper understanding of the disease category, and learners rely less on the surface features. Calibration shows students who were taught using contrasting cases were able to collect and interpret pertinent radiographic features to arrive at the correct interpretation.

Conclusion: Using contrasting cases as an instructional strategy in oral radiology appears to be promising.

84: HUMAN ANALOGUE STUDY ASSESSING POSSIBLE IMPACT OF CBCT ON OUTCOME EFFICACY IN ENDODONTIC ACCESS CAVITY PREPARATIONS

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Aim: To identify if supplemental CBCT imaging could potentially improve outcome after endodontic access cavity preparation in a human analogue 'with or without study' using 3D-printed maxillary first molars (M1Ms).

Material\Methods: After pilot and sample size calculation, 18 operators with 3 experience-levels were randomised to two simulated clinical sessions. An 8-week washout period was implemented prior to session 2. Operators attempted location of all 4 root-canals in three custom-made M1Ms of differing anatomical complexity, consulting preoperative periapical radiographs +/- CBCT imaging. Primary outcome was tooth volume removed (ITK-SNAP-quantified) and secondary outcomes were linear cavity-dimensions, canals located, and procedural-time. Operator confidence and 'helpfulness' of both conventional/CBCT imaging on canal location was assessed using a five-point confidence scale rating.

Results: 108 access cavities were analysed. Supplemental CBCT-imaging significantly reduced tooth volume removed, procedural time (Paired t-tests, $p < 0.05$) and increased mesiobuccal-2 (MB2) canal location (Fishers Exact test) for standard anatomies and more experienced operators. Linear mixed-effect modelling, identified image type and operator experience as significant with respect to tooth volume removed and procedural time ($p < 0.05$), but not the study session (1st/2nd). There was significantly lower confidence in canal location and perceived 'helpfulness' (all experience groups) with/of conventional imaging alone compared with additional CBCT imaging.

Conclusions: Within the limitations of this 3D-printed study, supplemental preoperative CBCT availability reduced tooth volume removed, procedural time and improved location of MB2 canals, with simpler anatomies and experienced operators. These findings could potentially impact on endodontic outcomes including fracture resistance, tooth survival and reduction of apical disease.

86: THE APPLICATION AND THE VALIDITY OF A NEW COMPOSITE RADIOGRAPHIC INDEX IN PATIENTS WITH OSTEONECROSIS OF THE JAWS

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Aim: The purpose of this study is to apply the Composite Radiographic Index modified (CRIm) in CBCT scans of patients with Medication related osteonecrosis of the jaws (MRONJ) in order to detect its validity, and correlate the radiologic findings with the clinical staging of the disease.

Material and Methods: This study included 43 patients with MRONJ diagnosis and CBCT scans performed in the School of Dentistry and approved by the Research Ethics Committee.

Clinical staging for every patient (0-3) was provided according to AAOMS 2022 guidelines. In cases of patients with both jaws affected, each jaw was evaluated independently resulting to 52 CBCT scans. The 52 CBCT scans were assessed under standardized viewing conditions by 2 observers who evaluated independently the following 8 radiologic features: lytic changes, sclerosis, periosteal reaction, sequestration, non-healing extraction sockets and other findings (sinus implication, inferior alveolar canal involvement, jaw fracture). The CRIm index was constructed to assess the extent of osseous changes. The radiologic features were scored as absent (0), localized/single (1), extensive/multiple (2), yielding a theoretical range of 0-12. For statistical analysis Fisher's exact test and Spearman's correlation coefficient were performed.

Results: A statistically significant association of clinical stage with lytic changes, sequestration and inferior alveolar canal involvement was found. Also, a statistically significant correlation of clinical stage with CRIm index classification was obtained.

Conclusion: The CRIm index tends to increase as the clinical stages of MRONJ advance suggesting, a correlation between the clinical stage of MRONJ and the CRIm index.

87: DENTAL-DEDICATED MAGNETIC RESONANCE IMAGING AND CONE BEAM COMPUTED TOMOGRAPHY FOR APICAL PERIODONTITIS ASSESSMENT: A COMPARATIVE IN VIVO PILOT STUDY

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Aim: To compare dental-dedicated magnetic resonance imaging (ddMRI) to cone beam CT (CBCT) as an imaging modality for diagnosing apical periodontitis (AP).

Material and Methods: Ten patients referred for CBCT imaging (X1, 3Shape, Copenhagen, Denmark; field-of-view 5x5 cm, resolution 0.15 mm) due to suspicion of a periapical lesion were also imaged using ddMRI. ddMR images were acquired on a Magnetom Free.Max (Siemens Healthineers, Erlangen, Germany) equipped with a dental-dedicated coil (Rapid-Biomedical, Rimpfing, Germany), using two sequences (6x6 cm FOV, section thickness 2 mm): proton-density-weighted turbo spin-echo (PD-TSE) for sagittal and coronal sections (resolution 0.3 mm) and a PD-TSE with fat suppression for sagittal sections (resolution 0.4 mm). Three observers assessed the presence of AP (disease/healthy/unsure) in representative sections of the CBCT and ddMRI. Inter- and intra-observer reproducibility were assessed by means of Kappa statistics. A mathematical consensus observer was defined for each of the two modalities based on the scores from the three observers, and these were statistically compared (McNemar test).

Results: Inter-observer reproducibility was moderate (0.61-0.8) for CBCT, and ranged from moderate to excellent for ddMRI (0.62-1.0). Intra-observer reproducibility ranged from moderate to excellent for CBCT (0.61-1.0) and was moderate (0.66-0.79) for ddMRI. There was no statistically significant difference between CBCT and ddMRI ($p=0.94$).

Conclusion: In this pilot study, ddMRI was comparable to CBCT regarding the assessment of apical periodontitis in humans. Further education and specific ddMRI training is needed to improve observers' expertise with this novel imaging modality.

90: EVALUATION OF DENTAL STUDENTS' PANORAMIC RADIOGRAPHY KNOWLEDGE BEFORE AND AFTER CLINICAL INTERNSHIP

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Aim: Our study aims to investigate the awareness and development of fourth and fifth-year dental students during one month of oral, dental, and maxillofacial radiology internship. Specifically, we aim to assess their ability to identify and differentiate basic anatomical landmarks on panoramic radiographs.

Material and Methods: In this study, conducted at Bezmialem Vakıf University Faculty of Dentistry, fourth and fifth-year dental students were examined. Their ability to recognize and accurately assess anatomical structures identified through panoramic radiography was investigated. Participants were asked questions about identifying anatomical structures in radiographic images at the beginning and end of their oral, dental, and maxillofacial radiology internship, without the stress of scoring. The correct answer rates were compared before and after the internship to determine the program's impact. Survey forms were created via Google Forms based on three panoramic radiographs, each marked by three maxillofacial radiology specialists, identifying 35 anatomical regions/points.

Results: Our study is still ongoing and it has been observed that 70% of the students who participated at the end of the internship gave more correct answers than before the internship.

Conclusion: Panoramic radiography is the predominantly employed imaging method in dentistry. This technique plays a crucial role in diagnosing and treating dental and jaw diseases, as well as monitoring treatment progress. Additionally, panoramic radiographs are vital for identifying anatomical variations and detecting pathologies. For newly graduated dentists, developing awareness of these factors is of utmost importance.

91: DIAGNOSTIC IMAGE QUALITY IN BITEWING EXAMINATIONS

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Aim: To evaluate diagnostic image quality in bitewing examinations (BWE) and deficiencies in applied imaging technique.

Material and Methods: In total, 1000 randomly selected BWEs performed with CMOS-technique in 2019 as part of routine check-ups at general dental clinics in Västerbotten county council, Sweden, were retrospectively analysed. The assessment of image quality focused on possibility to diagnose caries and marginal bone level. Deficiencies related to applied imaging technique were analysed. If present, radiographic images of other categories than bitewings that compensate for deficiencies in the BWE were considered. Differences between age-groups, gender, sensor size and number of exposed images were analysed.

Preliminary results: Twenty-four of 304 (8%) BWEs were of optimal diagnostic quality considering both caries and marginal bone level; 80 (26%) met requirements for caries diagnostics and 67 (22%) for marginal bone level evaluation. Considering clinical factors in a holistic evaluation, 134 (44%) BWEs were of acceptable diagnostic quality. Gender didn't impact the image quality ($p=0.678$). However, the image quality was better with larger sensor size ($p=0.001$), among patients aged ≥ 13 years ($p<0.001$) (the larger sensors were more prevalent among these patients) and finally image quality correlated with extended examinations meaning higher number of exposures ($p=0.002$). Common deficiencies were related to incorrect sensor placement and beam angulation.

Conclusion: Less than 1 of 12 BWEs performed with CMOS-technique fulfilled the diagnostic requirements for caries and marginal bone level assessment. Opting for the larger sensor size and utilizing complementary exposures to improve the BWEs, would improve the outcome.

96: PATIENT KNOWLEDGE AND UNDERSTANDING REGARDING X-RAYS AND IMAGING EXAMS

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Aim: To assess patients' knowledge and understanding regarding imaging exams and their relation to ionizing radiation.

Material and Methods: Patients who sought dental care at Santa Maria Dental School clinics (Brazil) were invited to enroll in the study. Those who signed the informed consent form filled out a questionnaire. Data collection covered demographic information, knowledge regarding imaging exams, X-rays, and dental radiographs, and information sources (internet or dentist/physician). Data analysis was performed using descriptive statistics and chi-square test.

Results: Two-hundred-thirty-five participants were enrolled (mean age 44±15 years), of whom 60% were female and 68% had at least 8 years of formal education. Most participants (74.5%) reported knowing what X-rays are. When questioned if the following exams used X-rays, the broad majority said radiographs used X-rays (91.5%), but some mistakes were revealed for tomography (51.7%), mammography (59.4%), ultrasound (15%), and MRI (40.2%). Gender, educational level, and reported knowledge about X-rays were not associated with correct answers ($P>0.05$). Younger patients answered more accurately that ultrasound ($P=0.009$) and MRI ($P=0.025$) do not use X-rays, and older patients correctly associated mammography with X-rays ($P<0.001$). Patients whose information source was the internet tended to incorrectly associate that mammography ($P=0.007$) and tomography ($P=0.055$) did not use X-rays.

Conclusion: Patients mistake the imaging exams that use X-rays, even though they report knowing what X-rays are. Dentists should be aware of the misconceptions their patients may face in using the internet as a source of information and better inform patients regarding the imaging exams' acquisition.

99: DOES THE USE OF CENTRING RINGS CHANGE THE NUMBER OF RETAKES OR FREQUENCY AND SIZE OF CONE CUTS IN INTRAORAL IMAGES PERFORMED BY DENTAL STUDENTS?

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Aim: To assess whether use of centring rings for intraoral radiographic imaging (OI) reduce number of retakes or frequency and size of cone cuts in OI performed by dental students.

Material and Methods: Seventy-three dental students were randomly allocated to either test or control group before training OI on a phantom. Both groups used phosphor plate holders for periapical imaging (PA) of anterior and posterior teeth and for bitewings (BW). Additionally, the test group used dedicated centring rings mounted to the holder (Kerr, Hawe, USA). After phantom training, the students performed OI in 127 patients. Before patient examination, number of planned PA and BW were calculated. After patient examination, number of retakes in percentage was calculated in addition to frequency and size of cone cuts. Differences between the two groups were tested: number of retakes and size of cone cuts (Mann-Whitney U test), frequency of cone cuts (Chi² test).

Results: The test group performed 920 OI and the control 835. The number of BW retakes was significantly lower in the test group ($P=0.014$) whereas, there was no difference in PA retakes ($P=0.37$) between groups. Frequency of cone cuts was lower in the test group for both PA and BW ($P<0.001$). Size of cone cuts was lower in the test group although this was not significant ($P>0.20$).

Conclusion: In general, it seems beneficial to use centring rings for dental students when learning to perform OI since the number of retakes was reduced together with the frequency and size of cone cuts.

100: DIAGNOSTIC IMAGE QUALITY OF LOW-DOSE, STANDARD, AND HIGH-RESOLUTION CBCT FOR ALVEOLAR BONE MEASUREMENTS: AN EX VIVO STUDY IN HUMAN SPECIMENS

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Aim: To assess the impact of dose-lowering (LD) cone beam computed tomography (CBCT) protocols on the diagnostic image quality when performing linear bone height measurements for implant planning compared to standard (SR) and high-resolution (HR) protocols.

Material and methods: Forty-two potential posterior implant sites in human cadaveric mandibular specimens were selected and subsequently scanned in three CBCT units. Radiographic examinations included LD, SR, and HR protocols based on a small field-of-view (FOV) and factory set exposure parameters. Images of the implant sites were prepared and replicated for all protocols in dedicated software. Three blinded observers, independently and in randomised order, judged if the image quality was adequate for performing bone height measurements or not. Intra- and inter-observer reproducibility were expressed with kappa statistics for the number of non-measurable cases. Frequencies of non-measurable cases were compared for the units and their respective protocols.

Results: Interpretation of the intra-observer reproducibility for cases that were judged as non-measurable ranged from fair (0.328) to almost perfect (0.933). The inter-observer reproducibility among observer pairs ranged from fair (0.322) to substantial (0.668). Trends in frequencies of non-measurable cases were similar for protocols within each unit independent of observer, however, the high-resolution protocol of one unit resulted in the most non-measurable cases consistently among observers.

Conclusion: Diagnostic image quality when performing linear bone height measurements for implant planning was similar in volumes acquired with LD protocols compared to SR and HR protocols. It was not always the highest resolution protocol that provided the best diagnostic image quality.

102: PERFORMANCE OF A NOVEL PHOTON COUNTING INTRAORAL SENSOR IN THE ASSESSMENT OF CARIES-LIKE LESIONS

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Aim: To compare the diagnostic performance of a photon-counting (PC) sensor in comparison to 2 CMOS sensors in the assessment of caries-like lesions.

Material and Methods: Sixty extracted teeth (30 premolars, 30 molars) were selected. A demineralizing solution was used to induce caries-like defects on the distal surface of 15 premolars (dPM) and mesial surface of 15 molars (dM). The remaining sound teeth (sPM, sM) were kept caries-free. Phantoms were mounted in 4 different combinations: dPM-dM, dPM-sM, sPM-dM, and sPM-sM. Standardized radiographs were obtained with one PC (XpectVision-XVD2530) and two CMOS (RVG-6200, Dexis-IXS) sensors. All images were coded and scored by three calibrated dentists using a 5-point scale. Observers' agreement, sensitivity, specificity, accuracy and area under curve (AUC) were calculated and verified through Kappa, ANOVA and Tukey test.

Results: The intra- and interobserver agreements varied from fair to perfect agreement. The tested sensors presented values of specificity (70.57-83.35), accuracy (64.98-71.10), and AUC (72.63-78.00) with no statistically significant differences ($p>0.05$). PC sensor presented higher sensitivity when compared to RVG-6200 ($p=0.017$). When comparing different teeth (dPM, dM) within the same sensor, sensitivity was higher for dPM on all sensors and AUC was higher for dPM on Dexis-IXS and PC sensors.

Conclusion: The performance of the PC sensor was similar to that of the more commonly used sensors. The PC sensor presented slightly superior sensitivity in diagnosing caries-like lesions when those were truly present.

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104: PULPA X-RAY DEPTH ANALYSIS AND 3D MODELING SOFTWARE VIA PERIAPICAL RADIOGRAPHY

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Aim: Aim is to perform depth analysis and 3D modeling of the pulps of single-root teeth using periapical radiographs (PAR) without requiring additional radiation. For this application, a software (XPAR) that creates a depth map from the gray values in PAR was used.

Material and Methods: Retrospectively, both cone beam computed tomography (CBCT) and PAR images of 31 single-root teeth were included. PARs were examined and zones where depth decreased (bifurcation, transition from elliptical to oval form, pulp stone/calcification, thick alveolar bone, imaging artifact) and depth increased (accessory canal, internal/external root resorption) were analyzed by XPAR. The same teeth were also analyzed with CBCT. XPAR and CBCT findings were evaluated separately and as those obtained by consensus.

Results: A total of 23 and 16 abnormal depth decrease zones were detected with XPAR and CBCT, respectively. A total of 20 and 18 abnormal depth increase zones were detected with XPAR and CBCT, respectively. A total of 11 depth decrease zones (4 bifurcation: 80%, 3 transition from elliptical to oval form: 60%, 2 pulp stone/calcification: 40%, 2 thick alveolar bone: 100%) were detected both XPAR and CBCT by consensus. Also 6 depth increase zones (5 accessory canal: 29%, 1 internal/external root resorption: 100%) was determined by consensus.

Conclusion: XPAR can be useful in detecting bifid canal formation in single-root teeth and buccolingual form changes in the canal. XPAR software needs to be developed to increase diagnostic accuracy in detecting accessory canals in the root apex.

105: CURRENT STATUS OF TELERADIOLOGY SERVICES IN JAPAN BASED ON MEDICAL FEE CLAIMS FROM THE NATIONAL HEALTH INSURANCE

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Aim: Claiming medical fees from the National Health Insurance for dental teleradiology became possible approximately 10 years ago. Our dental university hospital has been providing teleradiological services in dentistry for some time now. This study aimed to analyze the cases examined to date and discussed the future direction of teleradiology in dentistry.

Material and Methods: We reviewed a total of 400 cases in which dental clinics and hospitals claimed medical fees for using our dental hospital's teleradiology service over the past 5 years. Specifically, the age, sex, disease, and modality used, as well as the name and modality of the imaging diagnosis, of the extracted cases were analyzed.

Results: In dental clinics, cone-beam computed tomography (CBCT) was the most commonly used modality, and most cases were chronic apical periodontitis, supernumerary teeth, and impacted wisdom teeth. Conversely, the modalities used in our hospital were CBCT, CT, and MRI, with tumors, cysts, and inflammatory diseases found in most cases. The number of cases sent to the teleradiology service showed a declining trend in dental practices.

Conclusion: The analysis revealed a wide division between dental clinics and hospitals in the number of lesions transmitted. Regarding teleradiology based on claims for medical fees from the National Health Insurance, the low number of cases sent by dental clinics was because of problems with the insurance system and incentives, etc. Dental teleradiology in Japan was expected to remain polarized.

106: USE OF SPHERICAL SEGMENTATION RADIOMIC ANALYSIS FOR DIFFERENTIATION OF ODONTOGENIC KERATOCYSTS AND RADICULAR CYSTS

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Aim: The primary objective of this investigation was to assess the capability of radiomics in distinguishing between odontogenic keratocyst (OKC), characterized by aggressive clinical behavior and a heightened recurrence rate, and radicular cyst (RC), an inflammatory odontogenic cyst. Additionally, this study employed an experimental spherical segmentation technique, strategically designed to unveil the inherent characteristics of the lesions under scrutiny.

Material and Methods: This retrospective group comparative research evaluated histopathologically verified cases of OKC and RC which were retrieved from archives of the Department of Oral and Maxillofacial Radiology at Kocaeli University Faculty of Dentistry. Cases possessing lesions with intact osseous boundaries and with no evidence of any perforation were included in the study. In 3D Slicer software, a total of 93 radiomic features were extracted using the SlicerRadiomics plugin for the segmented area of the lesions.

Results: The CBCT data of a total of 10 OKC and 10 RC cases were analysed. The radiomics scores obtained from the calculations had a sensitivity value of 80%, and a specificity value of 80% in predicting radicular cysts. The model was found to accurately detect radicular cysts at a rate of 80% and OKC at a rate of 80%. The radiomics score was higher in patients with OKC than those with RC (OR: 25.251; $p=0.018$).

Conclusion: The favorable outcomes of this study substantiate the potential utility of radiomics which may be useful before surgical intervention of RC and OKC lesions with similar radiologic features.

108: FRONTAL SINUS OSTEOMA IN A YOUNG PATIENT – CASE REPORT

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Paranasal sinus osteomas are slow-growing benign bone tumors that can present a variety of clinical symptoms depending on their size and location. Most osteomas are asymptomatic and occur in the frontal sinus. In rare circumstances, they might develop and expand into the cranial or orbital cavities, resulting in abnormal imaging characteristics.

Aim: To describe a clinical case of osteoma in the frontal sinus with the presence of an inflammatory sinus polyp in a 16-year-old female patient, referred to the radiology service due to a finding in a lateral teleradiography examination performed for orthodontic treatment.

Material and methods: A 16-year-old female patient was referred to the radiology unit following a lateral cephalometric radiograph performed for orthodontic treatment purposes. During a visit with the orthodontist at the same time, a tomographic examination of the facial sinuses was requested for a more thorough evaluation and better understanding of the lesion. The patient had no symptoms, a family history, or any other comorbidities. The tomographic sections revealed a well-defined hyperdense pedunculated lesion within the left frontal sinus, on the posterior wall, with dimensions are approximately 7.9 × 7.6 mm, in anteroposterior and transverse orientations. The left frontal sinus, showed mucosal thickening and polypoid development. There was no evidence of obstruction of the sinus or erosion through either the outer or inner wall of the sinus. Being referred to the otorhinolaryngologist.

Conclusion: The importance of early diagnosis is highlighted, which can be justified by the progressive and sudden nature of the injury.

109: PET CT SCAN OF MULTIPLE INVASIVE EXTERNAL CERVICAL ROOT RESORPTION IN DENOSUMAB TREATED METASTATIC BREAST CANCER PATIENT- A CASE REPORT

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Multiple invasive external cervical root resorption (ICCR) is a rare, idiopathic, and aggressive form of dental hard tissue loss at the cemento-enamel junction. Denosumab is an anti-RANKL antibody that suppresses clastic cell activity and hard tissue resorption. RANKL/RANK signaling system is essential in breast cancer primary oncogenesis, and contributes to migration and colonization of cancer cells in the bones. RANKL/RANK inhibitors are essential to minimize metastatic spread, reduce fracture risk and pain. ICCR in a single tooth was reported in patients under denosumab treatment and multiple ICCR was documented in cases of denosumab discontinuation.

Case summary: A 52 Y.O. female presented with three months facial edema, eating and speaking difficulties. Breast cancer diagnosed in 2014 following recurrence in 2017, she was treated with chemotherapy, immunomodulatory agents, and daily prednisone. Denosumab treatment lasted four years then discontinued prior to dental treatment to minimize MRONJ risk.

Clinical and radiographic examination showed rapidly progressive generalized ICCR. PET-CT scan showed FDG uptake at the resorption areas. To minimize MRONJ risk, no extractions were performed. Tissue biopsies demonstrated inflammatory cells and multinucleated giant cells. Second PET-CT scan following a month of Ibuprofen treatment demonstrated FDG uptake reduction.

Conclusion: Due to the high prevalence of breast cancer world-wide and the frequent use of this novel therapeutic strategy, the potential side effects of denosumab treatment/discontinuation including ICCR are of great importance to the practitioners.

110: ACCURACY OF DENTAL MRI FOR FULL-NAVIGATED DENTAL IMPLANT PLANNING IN A PRIVATE PRACTICE SETTING

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Aim: To investigate the accuracy of high-resolution dental MRI (dMRI) for full-navigated dental implant planning in a private practice setting.

Material and Methods: 13 patients scheduled for dental implant placement underwent 3T dMRI utilizing a 0.4-mm isotropic proton density (PD) weighted sequence within a 10-minute protocol. Subsequently, utilizing dedicated guided surgery software, virtual implant planning and surgical guide printing was executed. Surgical guides were placed intraorally during subsequent Orthopantomography. Finally implant placements were performed using a full-navigated protocol. The 3D position accuracy of 15 dental implants was evaluated by comparing the virtually planned and definitive implant position. The latter was defined by an intraoral scan.

Results: All dMRI-derived implant plans were suitable for implant planning. Three-dimensional deviations noted were 0.88 ± 0.69 mm at the entry point and 1.59 ± 0.78 mm at the apex, along with a mean angular deviation of 4.65 ± 2.79 degrees.

Conclusion: Within the limitations of this small patient cohort, dMRI-derived implant planning was feasible as all implant plans were suitable for surgery and observed accuracy was within the published range of CBCT-derived implant planning accuracy.

112: MEDICAL - DENTOMAXILLOFACIAL RADIOLOGIST COLLABORATION IN ANGIOGRAPHY FOR LIPS: A CASE REPORT

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Aim: The objective of this article is to report patient with abnormality in lip using Computed Tomography - Angiography (CT-A) examination and to describe collaborative work between medical radiologist and dentomaxillofacial radiologist.

Material methods: A 25-year-old woman was referred from the oral surgeon's private clinic to the radiology department's private hospital for an angiography with a complaint of swelling on the lower lip. The examination showed a lump on the lower lip's mucosa with no distinctive colour from the surrounding area. The procedure began with several preparation steps in patients, followed by the injection of contrast IV and the CT scanning. The CT-A result showed an alteration on the diameter branch of the inferior labial artery pars inferior m. orbicularis oris. There was no other abnormality finding.

Results: A dentomaxillofacial radiologist currently has the competency in expertizing abnormalities found in dental and maxillofacial area from imaging modalities. Teamwork between medical and dentomaxillofacial radiologist including discussion, supervision, interpreting as well as establishing a radiodiagnosis were performed to have a better exam result. On the other hand, CTA in lips was rarely reported in article. This modality could be an option as soft tissue imaging within the mouth might be challenging.

Conclusion: Based on the radiographic features, this lip anomaly in this case leads to a suspect of vascular aneurism. Multidisciplinary approach involving medical and dentomaxillofacial radiologist could be done when dealing with this particular case.

113: DEEP LEARNING BASED PAROTID GLAND SEGMENTATION ON COMPUTED TOMOGRAPHY IMAGES USING nnU-NETV2 FRAMEWORK

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Aim: This study aimed to develop and validate a deep learning algorithm, nnU-Netv2, for the segmentation of the parotid gland in both native and contrast-enhanced computed tomography (CT) images, enhancing the precision of anatomical segmentation in head and neck radiology.

Material and Methods: In this retrospective study, a total of 91 anonymized CT images of the head and neck region were employed. Ground truth labeling was performed with the CranioCatch Annotation Tool (CranioCatch, Eskisehir, Turkey) by a dentomaxillofacial radiologist. We employed the nnU-Netv2 framework to segment the parotid gland from a dataset comprising 101 DICOM files, converted into Nifti format for compatibility. The training set included 91 CT images, while the test set consisted of 10 CT images. A comprehensive training regimen was undertaken. The automatic segmentation performance was evaluated in terms of the F1-score, precision, sensitivity, and the Area Under Curve (AUC) statistics.

Results: The nnU-Netv2 algorithm demonstrated high performance, evidenced by an accuracy of 99.81%. The AUC for the model was 0.95; precision and recall were 0.894 and 0.903, respectively, further emphasizing the model's effectiveness. The Dice similarity coefficient was 0.898, indicating a robust congruence between the algorithm's segmentations and the ground truth.

Conclusion: The nnU-Netv2 network exhibits supreme performance in the segmentation of the parotid gland on CT images, offering near-perfect accuracy and high reliability in delineating gland contours. These results underscore the potential of advanced deep learning frameworks in improving anatomical segmentation, with significant implications for diagnostic radiology and treatment planning in head and neck pathologies.

114: DETECTION OF OSTEOPOROSIS IN DENTAL PANORAMIC RADIOGRAPHS USING DEEP CONVOLUTIONAL NEURAL NETWORKS: A PILOT STUDY

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Aim: The aim of this study was to evaluate the diagnostic success of various deep convolutional neural networks (CNNs) in diagnosing osteoporosis using dental panoramic radiographs.

Material and Methods: A total of 708 patients were included in our clinic between 2014 and 2024, consisting of 354 patients previously diagnosed with osteoporosis through dual-energy X-ray absorption (DEXA) scanning and with panoramic imaging, matched for age and gender with 354 non-osteoporotic individuals. The dataset was created from images obtained from all patients and divided into random training (70%), validation (15%), and testing (15%) datasets. The dataset was analysed using a series of deep CNN models including VGG16 and VGG19, which are visual geometry group (VGG) deep CNN models, Xception, Inception, MobileNet, MobileNet V2 and You Only Look Once (YOLO) V8 models.

Results: Out of the seven CNN models tested, YOLOV8 achieved the highest accuracy rate of 100%, followed by MobileNet V2 with 91.5%. YOLOV8 exhibited a precision value of 1.00, recall value of 1.00, F1 scores of 1.00, and an AUC value of 1.00. On the other hand, the Inception model demonstrated the lowest performance with an accuracy of 85.8%, precision and recall of 0.86, F1 scores of 0.86, and an AUC of 0.92.

Conclusion: Deep CNN models have shown a high diagnostic performance in detecting osteoporosis patients identified by DEXA, which is considered the gold standard for determining bone mineral density, using only panoramic radiographs. These results can provide valuable information to dentists for the early detection of osteoporosis.

115: DEVELOPMENT AND TESTING OF A CARRIER PHANTOM FOR EXAMINING DENTAL MATERIALS IN DENTAL-DEDICATED MAGNETIC RESONANCE IMAGING

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Aim: To develop and test a phantom to be used as a carrier for examining dental materials in dental-dedicated magnetic resonance imaging (ddMRI).

Material and Methods: The phantom was composed of five glass test tubes vertically positioned in a glass beaker. All tubes were filled with air, distilled water, 1.5% agar, 0.3 g.L⁻¹ Ni(NO₃)₂ in 1.5% agar, or 1000 g.L⁻¹ K₂HPO₄. The beaker was filled with distilled water, 0.3 g.L⁻¹ Ni(NO₃)₂ aqueous solution, or 1000 g.L⁻¹ K₂HPO₄ aqueous solution. The phantom was scanned using a ddMRI system with a dental-dedicated radiofrequency surface coil and a proton density turbo-spin-echo pulse sequence. Triplicate scans were conducted for each combination of five tube fillings with three beaker solutions, yielding 45 image volumes. Mean voxel value (MVV), voxel value inhomogeneity (VVI), image noise (IN), and contrast were evaluated.

Results: For the tubes, MVV ranged from 9.19 (air) to 322.31 (Ni(NO₃)₂ with water). VVI ranged from 1.59 (air, with water) to 24.74 (K₂HPO₄). IN varied from 5.46 (air, with water) to 16.26 (Ni(NO₃)₂ in agar). For the phantom body, MVV ranged from 196.54 (water, with air) to 391.99 (Ni(NO₃)₂, with Ni(NO₃)₂ in agar). VVI ranged from 10.50 (Ni(NO₃)₂, with K₂HPO₄) to 18.62 (Ni(NO₃)₂, with agar). IN ranged from 5.23 (water, with air) to 18.41 (K₂HPO₄). Contrast ranged from 12.67 (water) to 362.25 (air, with Ni(NO₃)₂).

Conclusion: The developed phantom composed of tubes filled with 1.5% agar surrounded by a 1000 g.L⁻¹ K₂HPO₄ aqueous solution seems to be feasible for ddMRI quality assessments.

116: IMAGE ARTIFACTS GENERATED BY ZIRCONIA IMPLANTS AND THEIR IMPACT ON MAGNETIC RESONANCE IMAGE QUALITY

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Aim: This study assessed the artifact formation in MR scans caused by dental implants ex vivo in human mandibles. It was hypothesized that zirconia implants generate fewer artifacts than titanium implants and, therefore, the surrounding anatomy can be accurately assessed.

Material and Methods: Four dental implants with varying diameters, heights, and materials combined with different abutments and crowns were used. The implants were placed in partially edentulous human mandibles. MRI at 3.0 Tesla and CBCT were acquired of each mandible before and after implant placement. The extent of artifacts generated by each implant was assessed on 3D T1-weighted MRI. The mean size of the artifact was divided by the actual size of each implant to show overestimation. To qualitatively evaluate the images using CBCT images as reference, buccal and oral bone thickness at the implant shoulder and the distance between the implant tip and nerve canal were measured. Variances were calculated using one-way ANOVA with Bonferroni correction.

Results: The overestimation of titanium implants in diameter and length on MR images was significantly higher compared to zirconia implants ($p < 0.001$). The underestimation of buccal and lingual bone crest in MR images with titanium implants was also significant compared to zirconia implants ($p < 0.001$). No significant difference between titanium and zirconia implants in underestimating the distance implant tip-nerve canal was found.

Conclusion: Zirconia implants generate significantly fewer MRI artifacts compared to the titanium implant. Those artifacts impair the assessment of periprosthetic anatomy. The artifact size was not influenced by abutment and crown material.

117: INTERFERENCE OF TITANIUM AND ZIRCONIA IMPLANTS ON DENTAL-DEDICATED MAGNETIC RESONANCE IMAGE QUALITY: EX VIVO AND IN VIVO ASSESSMENT

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Aim: To assess the impact of titanium and zirconia implants on dental-dedicated MR image (ddMRI) quality ex vivo (magnetic field distortion, MFD) and in vivo (artefacts).

Material and methods: ddMRI were acquired (Magnetom Free.Max, 0.55T, Siemens Healthcare, Germany) using a dental-dedicated coil (Rapid-Biomedical, Germany). Ex vivo: three phantoms were manufactured: one with an agar-embedded titanium implant, one with an agar-embedded zirconia implant, and one with agar 1.5% (control). Field-map analysis of images acquired at 0.55T, 1.5T (Magnetom Sola, Siemens Healthineers, Germany) and 3T (Magnetom Lumina, Siemens Healthineers, Germany) was done to illustrate the extent and severity of MFD caused by the implants. In vivo (0.55T only): a splint was designed to serve as implant carrier allowing diverse implant positions (0, 1, 2, or 5 implants of each material). With this, a volunteer was imaged using multiple pulse sequences. Three blinded observers scored the images twice for the presence, severity, and type of artefacts, illustrated by descriptive statistics and inter- and intra-observer reproducibility (kappa statistics).

Results: Ex vivo: titanium produced more severe MFD than zirconia. MFD extent and amplitude increased with field strength ($0.55T < 1.5T < 3.0T$). In vivo: titanium and zirconia produced artefacts, generally as signal voids in tooth crowns close to implants. Inter- and intra-observer reproducibility ranged from 0.22-0.70, and 0.27-0.57, respectively.

Conclusion: Titanium generated larger MFD than zirconia. For both materials, artefacts were visible mainly in the crown area. Observer reproducibility needs improvement by ddMRI training.

118: INTRAORAL ULTRASONOGRAPHY IN ASSESSING THE DEPTH OF INVASION OF T1 – T3 STAGE ORAL SQUAMOUS CELL CARCINOMA

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Aim: To determine accuracy of intraoral ultrasonography (IOUS) in assessing the depth of invasion (DOI) of oral squamous cell carcinoma (OSCC), as well as to compare it with the accuracy of multidetector computed tomography (MDCT).

Material and methods: Prospective study with time limitation of 9 months included 18 patients with a clinical diagnosis of an OSCC. All patients underwent IOUS and MDCT examination at the same institution. Histopathological (HP) analysis confirmed T1-T3 OSCC in all sublocations (3 - the buccal mucosa, 2 - the mouth floor, 2 - the dorsal tongue side, 5 - the ventral tongue side, 6 - the lateral tongue edge), and HP DOI measurements were correlated with those obtained by CT and IOUS. The analysis of the obtained data were performed using the statistical package SPSS 22 and Pearson correlation coefficient.

Results: Both techniques, IOUS and CT showed a significant and strong positive correlation of DOI measurements with analogue HP measurements (0.940 and 0.932, respectively, $p < 0.001$). Although without a significant difference between the compared imaging modalities, we have to note that in 3 out of 18 patients, tumor lesion was obscured on MDCT due to artifacts originating from dental restorations.

Conclusion: IOUS showed high accuracy in assessing DOI of OSCC. In cases where metal dental restorations are a limiting factor for MDCT, IOUS has proven to be a competitive, easily applicable alternative modality in the evaluation of OSCC at accessible locations.

119: TREATMENT PLAN FOR IMPACTED MAXILLARY THIRD MOLARS BASED ON RADIOLOGICAL FINDINGS VARIES AMONG ORAL SURGEONS – A WEB-BASED “PAPER” CLINIC STUDY

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Aim. To identify and explore variation in treatment plans and pathological findings related to impacted maxillary second and third molars based on panoramic images and CBCT among Danish and Dutch oral and maxillofacial surgeons.

Material and Methods. This web-based “paper” clinic contained 10 cases of impacted maxillary third molars comprising relevant clinical information, panoramic images, and selected CBCT-sections. Twenty-eight surgeons were included. Treatment plan and pathological findings were evaluated based on clinical information and a panoramic image, thereafter, based on CBCT. Options for treatment plan for third molars were no treatment or third molar removal. Options for treatment plan for second molars were no treatment, second molar removal, or endodontic and/or filling therapy. The surgeons assessed pathology including external root resorption of the second molar, marginal bone loss of the second molar, and follicular space related to the impacted third molar.

Results. A change in treatment plan between the panoramic image and CBCT was registered between 0% and 43% of the surgeons among the cases. The surgeons did not agree completely on the treatment plan for the second and the third molar in any of the cases. Variation was also present among the surgeons when evaluating pathological findings. In several cases, severity of root resorption was rated worse in CBCT than in the panoramic image.

Conclusions. Variation in both treatment plan and pathological findings related to maxillary second and third molars was observed among the surgeons. No correlation between change in pathological findings and change in treatment plan was found.

120: IMPACT OF COMMON DENTAL MATERIALS ON METAL ARTIFACT REDUCTION IN MAXILLO-FACIAL MDCT EXAMINATION

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Aim: To investigate the impact of common dental materials on metal artifacts during MDCT examination.

Material and methods: A mandibular model, comprising restored human teeth, was created. Six dental materials were molded as teeth coverage to uniform thickness: A-Silicones (Elite HD+, and Vonflex S Putty), Alginate (Tropicalgin), Pink wax (MBwax1), C-Silicon (Zetaplus) and Zinc-oxide (COE-PAK). The model alone (control), and with teeth covered by each of the materials, underwent MDCT scanning (Philips Ingenuity 64), using standard, and a low dose protocol. Each dataset included original, and images reconstructed with O-MAR algorithm. Two experienced radiologists analyzed obtained datasets: quantitatively- by measuring standard deviations (SD) within the selected region of interest (ROI), and qualitatively (using a five-point Likert scale). The data were analyzed using standard one-way analysis of variance (ANOVA). Inter-rater reliability was examined.

Results: Intraclass Correlation Coefficient for all measurements was between 0.806- 0.996. Excluding Alginate (with both protocols) and C-silicon (low dose protocol), each material significantly differed from the control ($p < 0.01$). Vonflex showed the lowest SD values in both protocols, while the highest values were recorded for control, and for Alginate at standard protocol. With O-MAR, all SD values decreased- the most drastically for Alginate, and higher scores were reached in qualitative analysis. Qualitative analysis did not show significant differences between the control and any of the tested materials.

Conclusion: Covering teeth with certain dental materials, especially Vonflex, quantitatively reduced image noise. Still, in contrast to O-MAR algorithm, they did not show a visible, qualitative impact on the artifact reduction.

122: DENTAL AGE ESTIMATION BY DEEP LEARNING MODEL FROM PERIAPICAL RADIOGRAPHS IN THAIS

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Aim: To develop a novel deep-learning model for age estimation from periapical radiographs of upper incisors in Thais.

Material and Methods: The dataset consists of 2,000 periapical radiographic images of upper central incisors, totaling 3,351 teeth. These images were randomly collected from 2014 to 2023, comprising 917 males and 1,083 females aged between 10 to 83 years. Labelbox was used to create a root and root canal segmentation mask. All datasets were randomly distributed into training, validation, and testing datasets in 2,675: 341: 335 ratios. The steps for developing the deep learning model are as follows: (1) Training DeepLabv3+ on the training set to segment the area of interest (root and root canal). (2) ResNet50 was trained for age estimation from the training dataset and segmented images. (3) The validation dataset was used for model selection. (4) The testing dataset, including 335 teeth, was used for dental age estimation.

Results: The estimation error of the developed deep learning model was acceptable, with the mean absolute error (MAE) of 6.72 years for the testing dataset.

Conclusion: The developed deep learning model introduced in the present study is effective. It is an economical and less time-consuming method for dental age estimation, especially in a large sample group.

123: ACCURACY OF PERIAPICAL RADIOGRAPHS AND CBCT FOR DIAGNOSING APICAL PERIODONTITIS. AN EX VIVO HISTOLOGICAL STUDY ON HUMAN CADAVERS

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Aim: To assess the diagnostic accuracy of periapical radiographs (PA) and CBCT to diagnose apical periodontitis (AP) using histology as reference standard.

Material and Methods: PA and CBCT were performed on 221 teeth from human specimens. Teeth from all tooth groups, with different disease and treatment status were included: root filled teeth (n=71), non-root filled teeth (n=150). PA were acquired using a 'Gendex 1000 DC' X-ray unit (Gendex Corporation, Milwaukee, WI, USA), and phosphor plate system (Dürr Dental VistaScan Plus, Dürr Dental AG, Bietigheim-Bissingen, Germany). CBCT was performed using Cranex® 3Dx (Soredex Oy, Tuusula, Finland, FOV 5x5 cm, and resolution 0.08 mm). The presence of AP was assessed in PA using Periapical Index, and in CBCT using a probability index. Histology was used as a reference standard to compute sensitivity, specificity, positive predictive values (PPV), and negative predictive values (NPV)

Results: On PA non-root-filled teeth produced estimates of 73%, 89%, 53%, and 95% regarding sensitivity, specificity, PPV, and NPV, respectively. For root-filled teeth, the estimates were 73%, 68%, 63%, and 78%, respectively. On CBCT non-root-filled teeth produced estimates of 96%, 92%, 75%, and 99% regarding sensitivity, specificity, PPV, and NPV, respectively. For root-filled teeth, the estimates were 67%, 70%, 71%, and 76%, respectively.

Conclusion: The diagnostic accuracy for diagnosis of AP differs whether the tooth is root filled or not, and it is lower in root-filled teeth for both PA and CBCT. In particular, PPV-values were low, indicating a high risk of over-diagnosis in both diagnostic modalities.

126: AUTOMATIC VIEW PLANNING IN DENTOMAXILLOFACIAL MAGNETIC RESONANCE IMAGING

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Aim: To facilitate ease of use and to enhance efficiency in dental-dedicated MRI scanning procedures, an automatic section planning software was developed for a selection of dentomaxillofacial workflows at 0.55 Tesla.

Material and Methods: A suitable set of anatomical landmarks were annotated in scout images (n=70 subjects) covering the entire dentomaxillofacial region and acquired on a dental-dedicated 0.55 Tesla MRI system (MAGNETOM Free. Max, Siemens Healthineers AG, Germany). An AdaBoost-based machine learning algorithm was trained to detect these landmarks automatically and to calculate standard dental views, thereby allowing for automatic view planning as part of the examination workflow. Section planning was automated for longitudinal, cross-sectional. and axial sextants of the dental arches and for standard views in TMJ imaging and orthodontics. The automated planning performance was evaluated retrospectively in an additional 133 subjects, including instances where dental material produced artefacts, e.g., retainers, titanium implants, and prospectively on a scanner.

Results: Overall, the performance of the automatic planning algorithm was adequate and provided results ca.10 seconds following scout scan completion. Even in subjects with metal prostheses, view planning was often acceptable; in 3 cases the algorithm failed, and manual planning was performed. Quality of landmark detection was rated very good in 88.4%, good in 8.1%, marginal in 1.3% and failed in 2.2%. In some cases automatic planning was suboptimal due to sporadic misdetection of molar roots.

Conclusion: Automated section planning based on landmark detection in dentomaxillofacial MRI scout images is feasible and will enable time-efficient scan planning even with limited operator experience.

130: ORIENTED TOOTH DETECTION USING YOLOV8-ORB MODELS

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Aim: This study aimed to assess the performance of YOLOv8 Oriented Bounding Box (YOLOv8-ORB) models in automated tooth detection tasks, utilizing oriented bounding boxes aligned with the axis of each tooth, in orthopantomography (OPG) images.

Material and Methods: A dataset consisting of 560 OPG images was utilized for training, validation, and testing purposes. The dataset was split into training (80%), validation (10%), and test (10%) sets. Two YOLOv8-ORB models (nano and small size) were employed for automated tooth detection and assigned tooth numbers following the FDI system.

Results: The results demonstrated that both YOLOv8-ORB-nano and YOLOv8-ORB-small models exhibited high precision and recall for tooth detection. YOLOv8-ORB-nano achieved a precision of 0.968, recall of 0.951, F1 score of 0.959, and mean average precision (mAP50) of 0.964. Meanwhile, YOLOv8-ORB-small achieved a precision of 0.971, recall of 0.963, F1 score of 0.967, and mAP50 of 0.974. In the tooth detection and numbering task, YOLOv8-ORB-nano achieved a precision of 0.669, recall of 0.684, F1 score of 0.676, and mAP50 of 0.715. Notably, YOLOv8-ORB-small outperformed its nano counterpart, with a precision of 0.826, recall of 0.758, F1 score of 0.791, and mAP50 of 0.815.

Conclusion: The findings underscore the effectiveness of YOLOv8-ORB models for oriented tooth detection tasks in OPG images. YOLOv8-ORB-small, in particular, demonstrated superior performance compared to YOLOv8-ORB-nano, offering promising results for dental imaging applications. These results highlight the potential of YOLOv8-ORB in enhancing automated dental radiographic image analysis workflows.

132: DETECTION OF PERIAPICAL LESIONS IN PEDIATRIC PATIENTS WITH A DEEP LEARNING METHOD ON PANORAMIC RADIOGRAPHS

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Aim: is to develop a novel deep-learning algorithm that automatically detects periapical lesions in young patients with mixed dentition.

Material and Methods: Panoramic radiographs from the hospital archive, focusing on patients aged 6-12 with periapical lesions in deciduous teeth, were randomly selected. Two dentomaxillofacial radiologists chose 283 radiographs for analysis. The dataset comprised 380 periapical lesions, with 302 in training set and 78 in test set. The radiologists collaboratively labeled the periapical lesions, using rectangular boxes within the makesense.ai annotation software. A deep learning model was trained based on YOLO v7 using Google Colab and Python to detect the lesions. Also, 78 radiographs, randomly selected from the training set, were presented to ten last-year dental students with the instruction to identify periapical lesions originating from deciduous teeth. The diagnostic performance of both the model and the students was assessed using accuracy, sensitivity, specificity, precision, F1 score, and error rate metrics.

Results: The YOLO algorithm yielded a higher accuracy rate of 88.0% compared to the students' 76.3%. The sensitivity of the algorithm at 76.1% surpassed that of the students at 55.2%. The YOLO algorithm demonstrated superior specificity at 99.8% compared to the students' 97.3%. The algorithm exhibited higher precision at 99.8% compared to the students' 95.3%. The F1 score increased notably to 86.4% with the algorithm compared to the students' 69.9%.

Conclusion: The findings underscore a substantial enhancement in the YOLO algorithm's ability to detect periapical lesions in deciduous teeth on panoramic radiographs compared to the diagnostic performance of the students.

135: PAI MEETS AI – CAN ARTIFICIAL INTELLIGENCE PERFORM CLASSIFICATION OF ENDODONTIC TREATMENT OUTCOMES?

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Aim: To identify the most effective convolutional neural network (CNN) model for fine-tuning on a dataset of intraoral radiographs and to evaluate the accuracy of the fine-tuned model in classifying the periapical index (PAI), thereby determining the model's capability in accurately reflecting endodontic treatment outcomes.

Material and Methods: The model employed anonymized intraoral radiographs with landmarks and PAI scores from endodontic treatments performed at the University of Oslo. Scores were done by master students, residents in endodontics and PHD-candidates. A plugin to ImageJ was used to manually mark landmarks and set the PAI as an indicator for treatment outcome. The PyTorch library in the Python programming language was used to fine-tune and test several pretrained open-source CNN models. Several models including RESNET and VGG19 were fine-tuned on our dataset and tested for accuracy.

Results: A fine-tuned VGG19 based model performed best, achieving an accuracy rate of 64%.

Conclusion: While applying machine learning to image analysis in standard datasets, such as handwritten digits (MNIST) or flower classification, appears straightforward, the development of a model tailored to endodontic treatment evaluation poses significant challenges. Further results from refinement of training data and experimenting with different CNN models will be presented.

136: PATIENTS WITH CROWDING AND PARTIAL EDENTULOUS SPACES: THE INFLUENCE OF INTRAORAL SCANNING TECHNOLOGY ON TRUENESS OF DIGITAL IMAGES

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Aim: To evaluate the trueness in meshes obtained by two intra-oral scanning (IOS) technologies from patients presenting crowding and bilateral posterior edentulous space with tilted molars.

Material and Methods: conventional impressions and casts of two patients with the aforementioned dental arch conditions were produced and digitized on a desktop scanner to be used as the reference meshes. Then, the patients were scanned using confocal microscopy (CM; iTero Element 2) and blue laser-multiscan imaging IOS (BLM; Virtuo Vivo), totalling thirty scans. Meshes were exported in Standard Tessellation Language format and analysed using Geomagic Control X. Root mean square (RMS) error was calculated and presented in a colour map. Differences in IOS technologies were evaluated with paired t-tests ($\alpha=0.05$).

Results: Meshes from BLM showed greater discrepancy compared to CM in both dental arch conditions ($p= 0.0084$ and 0.0025 for crowding and partial edentulous space, respectively). The colour map showed discrepancies in buccal surface of crowding teeth when scanned using BLM, and in lingual surface using CM. For edentulous spaces with tilted molar, it showed similar discrepancy pattern at molars posterior to edentulous spaces for both IOS technologies.

Conclusion: Trueness of IOS scans of dental arches presenting crowding and edentulous spaces with tilted molars can be affected by the IOS technology.

138: A NEW ERA IN ROOT CANAL SEGMENTATION: AN INNOVATIVE AI-DRIVEN TOOL FOR AUTOMATED BI-ROOTED PREMOLAR ROOT CANAL SEGMENTATION ON CBCT

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Aim: To develop and assess the efficacy of an artificial intelligence (AI)-driven tool for the automated segmentation of root canals in bi-rooted premolar teeth using cone-beam computed tomography, and to compare its performance with that of human approach.

Material and Methods: In total, 111 CBCT scans were randomly divided into training (n = 55, 96 teeth), validation (n = 14, 16 teeth), and testing (n = 42, 72 teeth) sets. A convolutional neural network (CNN) model was trained using manual root canal segmentation by three operators as ground truth. The CNN automatically segmented CBCT scans in the testing sample, and identified errors were fixed, resulting in a refined-3D (R-AI) model. Segmentation performance was assessed by comparing AI and R-AI models. Thirty percent of the test sample was manually segmented for AI and human performance comparison, with segmentation time recorded in seconds (s).

Results: The AI-tool demonstrated outstanding performance, achieving a Dice similarity coefficient (DSC) of 88%±7%-93%±3 and a 95% Hausdorff distance (HD) of 0.13±0.06-0.16±0.06 mm. Notably, second upper premolars automated segmentation performance was slightly better than first premolars (p<0.05). In contrast to the manual approach, the AI-driven method exhibited higher recall, accuracy, and lower 95% HD (p<0.05). Furthermore, AI segmentation (42.8 ± 8.4 s) was 75 times faster than manual segmentation (3218.7 ± 692.2 s) (p<0.05).

Conclusion: The novel AI-driven tool developed and validated in this study provides highly accurate and efficient automatic root canal segmentation for bi-rooted teeth, surpassing human performance in accuracy and time efficiency.

139: ARTIFICIAL INTELLIGENCE BASED DENTAL ROOT CANAL SEGMENTATION FROM CBCT IMAGES

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Aim: This study aimed to develop and evaluate an artificial intelligence based automatic root canal segmentation method able to support root canal treatment.

Material and Methods: A UNet architecture-based fully convolutional neural network parameters were adopted to the given problem, where cone-beam computer tomography slices (501X501 pixel matrix, 100 µm voxel size) were processed. The data set consists of human molars and premolars. Ten images were used to assess the method's accuracy by calculating the mean Intersection over Union (mean IOU or Jaccard index) and the axial distance metric. An initial, empirical network's meta parameter optimization is applied mainly to avoid over-fitting the network. Two observers compared the visualized results from a efficiency semi-automatic segmentation with the results from the AI-based automatic segmentation method.

Results: The validation using the data set of ten teeth showed no sign of over-fitting during the training. The proposed model reached high segmentation accuracy, a high level of overlap between the segmented volumes and the given ground truth masks, the Jaccard index as high as 0.825 measured on the validation data set, and the axial distance was in the scale of the voxel size of the CBCT image. The visual evaluation by the experts showed no significant difference among the observers ($p > 0.05$) using the logistic regression model. The results showed that the method could produce accurate root canal segmentation with similar accuracy to the semi-automatic method.

Conclusion: The presented promising results motivate extending the data set and transferring the results towards clinical practice.

141: PERFORMANCE OF A DEEP LEARNING APPLICATION IN THE DETECTION OF PERIAPICAL LESIONS ON PANORAMIC RADIOGRAPHS

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Aim: The aim of our study is to determine the accuracy of an artificial intelligence based system in detecting periapical lesions on panoramic radiographs.

Material and methods: A total number of 357 panoramic radiographs were selected, comprising 308 teeth with clearly visible periapical radiolucency and 308 without any radiographic signs of periapical lesion. Three groups were generated: teeth with radiographic signs of caries, teeth with coronal restoration and teeth with root canal filling. The PRs were uploaded to the Diagnocat system (DC) for evaluation. The performance of the convolutional neural network in detecting PLs was assessed by its sensitivity, specificity values, as well as the correctly classified proportion values were calculated.

Results: Periapical lesions were detected in 240 (77.9%) cases out of the 308 teeth with PL by DC and no PL was found by 68 (22.1%) teeth with PL. The DC detected no PL in any of the groups without PL. The overall sensitivity, specificity and correctly classified proportion values of DC was 0.78, 1.00 and 0.89, respectively. Considering these parameters for each group, Group 2 showed the highest values at 0.84, 1.00 and 0.95, respectively. The AI-based system showed lower sensitivity and diagnostic accuracy of DC for detecting PL on canines with a value of 0.27 and 0.64, respectively.

Conclusions: The deep CNN-based Diagnocat system can support the diagnosis of PL on PRs, and serves as a decision support tool during the radiographic assessments.

142: THE ACCURACY ASSESSMENT OF A CNN BASED ARCHITECTURE IN THE ANATOMICAL IDENTIFICATION OF THE MAXILLARY SINUS AND INFERIOR ALVEOLAR CANAL ON CBCT .

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Aim: The objective of this study was to validate the diagnostic performance of a convolutional neural network (CNN)-based architecture for detecting the maxillary sinus & inferior alveolar canal on CBCT.

Materials and Methods: In this study, 412 CBCT scans were utilized. Patient radiographs were assessed using the PAC system at the Rishiraj Dental college from January 2020 to January 2024. Manual segmentation was performed with the assistance of the Artificial Intelligence (AI) system . The detection of the maxillary sinus and IAC was conducted through a CNN -based architecture.

Two independent Oral Maxillofacial Radiologists evaluated the maxillary sinus and inferior alveolar canal utilizing the Anatomage InVivo 3D software. A comparison was drawn between the results obtained from the human observers and the artificial intelligence model. Interobserver agreement and statistical analysis were carried out using the Pearson Product Moment.

Results: CNN architecture demonstrated success in the detection of the maxillary sinus and inferior alveolar canal on CBCT. The accuracy of correctly identifying the maxillary sinus and inferior alveolar canal was 91.2%. There was no significant difference between the two measurement methods ($P > 0.05$). The Pearson Product Moment revealed a strong correlation ($R > 0.5$) between the AI's perception. The AI correlation ranged from 0.906 to 0.918 for the number of maxillary sinuses and 0.912 to 0.924 for the inferior alveolar canal.

Conclusion: The disparity in the detection of the maxillary sinus and inferior alveolar canal between specialists and the AI algorithm did not yield statistically significant differences.

143: DIAGNOSTIC EFFICIENCY OF LOW-DOSE CBCT IN POST-GRAFTING EVALUATION AMONG SWEDISH PAEDIATRIC PATIENTS WITH ALVEOLAR CLEFTS

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Aim: Although cone-beam computed tomography (CBCT) has become a popular radiographic method in orofacial cleft cases, radiation doses are relatively high. One way of optimizing the radiation doses is by using low-dose protocols. The aim is therefore to investigate whether a low dose CBCT protocol provides diagnostically acceptable image quality for assessing bone healing after alveolar bone grafting.

Material and methods: The study was ethically approved by the Swedish Ethical Review Authority. Eleven patients with orofacial clefts, aged between 7 and 14 years old, who underwent alveolar bone grafting at Skåne University Hospital in Malmö, Sweden, were included. For each patient two CBCT protocols were conducted six months after surgery, one with a standard and one with a low-dose. The evaluation was performed by four observers.

Preliminary Results: No significant differences could be found between the standard- and low-dose protocols for the majority of the examined parameters, except for the subjective image quality for one of the observers, and confidence level in the evaluations for three of the observers.

Conclusion: The low-dose protocol appears to provide sufficient image quality to evaluate most of the analyzed parameters. Our findings could be valuable for implementing a low-dose protocol in clinical practice.

144: THE PERFORMANCE OF A CONVOLUTIONAL NEURAL NETWORK (CNN) BASED DEEP-LEARNING SYSTEM FOR CARIES DETECTION IN PANORAMIC RADIOGRAPHY

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Aim: The aim of this study was to validate the performance of a Convolutional Neural Network (CNN) based deep-learning system for caries detection in panoramic radiography.

Methodology: In this study, 1200 anonymous dental panoramic radiographs were analyzed by two independent dental surgeons.

A pre-trained model (the cloud-based platform of Velmeni Inc. company Convolutional neural network) was used to assess the panoramic radiographs at the Nair Hospital Dental College. A comparison was drawn between the results obtained from the human observers and the artificial intelligence model.

Background: A large percentage of adults are nowadays affected by dental caries. Accuracy of early diagnosis of dental caries is still a challenging problem for dentists. Dentists inspect caries on tooth surfaces by observation of texture and discoloration using the visual-tactile method. This method is highly subjective, based on the dentist's expertise. Hence it is necessary to implement an efficient, fully automatic, and accurate dental caries detection algorithm. These artificial intelligence systems with computer assistance have been created to help with diagnosis and treatment procedures related to dental imaging. In this study, we aim to evaluate the performance of a Deep learning artificial intelligence system model (A pre-trained model (the cloud-based platform of Velmeni Inc. company Convolutional neural network) for caries detection on panoramic Radiography.

Conclusion: The suggested AI model showed encouraging results in detection of carious lesions on panoramic radiographs. As AI models continue to advance in dental radiology, they will support clinicians in digitally based patient education as well as treatment planning.

145: ASSESSING THE ACCURACY OF A DEEP LEARNING-BASED APPLICATION IN THE DIAGNOSIS OF DENTAL CARIES ON INTRAORAL RADIOGRAPHS

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Aim: The objective of this study was to evaluate the performance of the Diagnocat (DC) system, which employs deep convolutional neural network (CNN), in detecting caries on intraoral radiographs.

Materials and Methods: The proximal surfaces of the 323 selected teeth on intraoral radiographs were evaluated by two independent observers using the deep learning-based DC system. The presence or absence of carious lesions was recorded (Phase 1). After 4 months, the AI-aided human observers evaluated the same radiographs (Phase 2), and the advanced CNN reassessed the radiographic data (Phase 3). Subsequently, the data reflecting human disagreements were excluded (Phase 4). For each phase, the Cohen and Fleiss kappa values, as well as the sensitivity, specificity and correctly classified proportion values of DC were calculated.

Results: The following Cohen kappa values of the two human and AI observers were determined during the phases: $\kappa=0.66-1$, $\kappa=0.58-0.7$, and $\kappa=0.49-0.7$, respectively. The Fleiss kappa values were ranged between the values of $\kappa=0.57-0.8$.

Conclusions: According to our findings, the assessed DC system can support the evaluation of intraoral radiographs for the diagnosis of dental caries, as determined by the agreement between human and AI observers.

146: COMPUTER SIMULATION FOR THE TREATMENT OF POST-TRAUMATIC OCCLUSAL SEQUELAE

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Aim: Facial traumatology occupies an important aspect and constitutes in itself a primary interest for the maxillofacial surgeon, Therefore, initial treatment must meet functional and morphological criteria, otherwise the after-effects complicate the therapeutic plan and compromise the prognosis.

Computer planning also makes it possible to make a diagnosis based on a cephalometric study as well as a precise therapeutic simulation.

Material and methods: a clinical case concerning a 42-year-old man victim of isolated facial trauma whose initial intervention was followed by an occlusal disorder as well as difficulty in nasal breathing. The therapeutic project consisted of a cephalometric study, an osteotomy simulation and a custom-made retention splint.

Results: the application of data saves time during surgery as well as stability of the result.

Conclusion: the computer tool has now become an important step in the therapeutic arsenal, in that it facilitates the diagnostic and therapeutic approach in orthognathic surgery without supplanting previous methods.

147: AN UNUSUAL CBCT RING ARTIFACT NOT PREVIOUSLY NOTED IN THE LITERATURE. A TECHNICAL REPORT.

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Aim: This presentation demonstrates an unusual ring artifact produced upon a CBCT exam and to our knowledge not yet observed in the literature.

Materials and Methods: We present an unusual case of multiple ring artifacts, which occurred during a patient examination performed on a NEWTOM VGI EVO CBCT scanner (NEWTOM/CEFLA S.C., Imola, Italy). The CBCT unit was installed in 2019 and is routinely serviced and calibrated by the vendor's authorized technician, every 6 months. The 74 year old male patient was referenced for a routine implant placement. The scan was reconstructed using the manufacturer's proprietary software.

Results: The artifact was seen in the lateral and frontal scout view, There are two intense nearly vertical lines on either side of both images, giving rise to the intense large ring artifact There are also at least six point-like spots at three different levels of the scout viewsgiving rise to two smaller and one larger ring artefact at three different cross-sectional planes, At a subsequent communication,the authorized technician and the vendor's application specialist postulated that there must have been a mechanical issue with the movement of the collimator, stating that "one curtain did not move to the correct position blocking the x-ray beam".

Conclusions: Although this might have caused the intense nearly vertical lines on the scout views and the corresponding large outer ring artifact, it does not explain the inner smaller artifacts. In our opinion, there are still technical issues dentists performing CBCT should be aware of and note.

148: INTERPRETATION OF INCIDENTAL HYPERDENSE SOFT TISSUE FINDINGS. A RETROSPECTIVE STUDY ON 511 CONE BEAM CT DATASETS

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Aim: To retrospectively evaluate and record hyperdense extra-gnathic findings in anatomic regions wherein soft tissue structures are located using a series of large field of view (FOV) CBCT datasets.

Materials & Methods: 511 anonymized consecutive large FOV CBCT datasets (voxel size 0.3mm) were obtained from the archive of the Department of Oral Diagnosis & Radiology. These were systematically evaluated and analyzed, by consensus, by a panel of two (2) oral and maxillofacial radiologists. Each finding in the scan volume was recorded separately as well as the patient's age and gender.

Results: A wide spectrum of hyperdense soft tissue findings was finally recorded to those of intermediate-high clinical significance such as intracranial carotid artery calcified atheromas (42.1%), extracranial carotid artery calcified atheromas (23.5%), and degenerative changes in the craniocervical joint, in particular, findings consistent with osteophytic changes located at the attachment sites of the anterior atlantoccipital membrane (40.5%), apical ligament of dens (36.4%), and anterior atlantoaxial joint (20%) being the most prevalent.

Conclusions: While apparently benign, hyperdense soft tissue findings can be of intermediate-high clinical significance. At any rate, thorough evaluation of large FOV CBCT datasets is highly recommended.

150: SEGMENTATION OF PULP AND PULP STONES WITH AUTOMATIC DEEP LEARNING IN PANORAMIC RADIOGRAPHS: AN ARTIFICIAL INTELLIGENCE STUDY

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Aim: Pulp stones are calcified masses of various sizes that may be found in dental pulp which can impact dental procedures. The purpose of this study was to measure the diagnostic accuracy of detecting pulp and pulp stone calcifications using artificial intelligence algorithms on panoramic radiographs.

Material and Methods: 713 panoramic radiographs that included at least one pulp stone were identified retrospectively and included in the study. 5,085 pulps and 4,675 pulp stones were marked on these radiographs using CVAT labeling software.

Results: In the test dataset, the AI model segmented 220 panoramic radiographs for pulp and 480 panoramic radiographs for pulp stone. The segmentation of pulp and pulp stone for precision and accuracy were 0.85, 0.998, 0.771, and 1, respectively. Artificial intelligence systems have the potential to overcome clinical problems. AI can facilitate the assessment of pulp stones and pulp based on panoramic radiographs.

Conclusion: Pulp and pulp stones can successfully be identified using artificial intelligence algorithms. This study provides evidence that artificial intelligence software using deep learning algorithms can be valuable adjunct tools in aiding clinicians in radiographic diagnosis. Further studies with larger data sets are required to increase the diagnostic accuracy rates of the artificial intelligence models.

153: BIOMECHANICAL EVALUATION OF DIFFERENT MINIPLATE SHAPES FOR MANDIBULAR SYMPHYSIS FRACTURE: A FINITE ELEMENT ANALYSIS USING CBCT DATA.

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Aim: This study aims to compare the biomechanical performance of different miniplate shapes in treating mandibular symphysis fractures.

Materials: A total of 432 DICOM files of the CT image were imported in Mimics software (Materialise, Leuven, Belgium) for the segmentation process to produce 3D model of mandible which consist of cortical and cancellous bone. STL files of the bones were imported into 3-Matic software (Materialise, Leuven, Belgium) for mesh editing and refinement processes. Four miniplate shapes (I, L, X, and Y) were designed and analyzed under masticatory loading conditions. A 200 N normal load was applied to incisor teeth, while condyles, coronoid process, and retromolar regions were fixed. Titanium alloy was chosen as the material for the miniplate and screw. Finite element analysis was conducted using Marc Mentat software.

Results: Results showed maximum von Mises stress levels below material yield stress for all miniplates and mandibles. Miniplate X exhibited the lowest maximum von Mises stress (9.91 MPa). Displacements for miniplates and mandibles were comparable at 0.06 mm and 0.07 mm, respectively, with inter-fragmentary displacement below the allowable limit of 0.38 mm.

Conclusion: In conclusion, despite differing shapes, all miniplates proved biomechanically safe for stabilizing mandibular symphysis fractures.

154: IN VIVO RELIABILITY AND ACCURACY OF DENTAL MRI FOR IDENTIFICATION OF CEMENTO-ENAMEL-JUNCTION

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Aim: To evaluate the reliability and accuracy of high-resolution dental MRI (dMRI) for in vivo identification of cemento-enamel junction (CEJ) using cone-beam computed tomography (CBCT) as reference imaging modality.

Methods: Three-Tesla dMRI and CBCT were prospectively acquired in 23 participants (mean age: $52,9 \pm 10,6$ years). A fat-saturated T2 weighted sequence with isotropic resolution of 0,6 mm was used in dMRI. In 319 teeth longitudinal axis for each root (389 roots) were reconstructed in CBCT and dMRI in the mesio-distal (M-D) and vestibulo-oral (V-O) direction and anonymized. Next, distance from CEJ to apex was measured altogether three times by a blinded dentist and a radiologist. Reliability/accuracy were assessed using intraclass correlation coefficients (ICCs)/Bland-Altman analysis.

Results: The reliability of dMRI was excellent and comparable to CBCT (intra-/inter-rater; dMRI vs. CBCT) M-D: 0,963/ 0,914 vs. 0,988/ 0,982; V-O: 0,969/ 0,868 vs. 0,99/ 0,984). Accuracy analysis revealed a mean error (95% confidence interval) of dMRI of 0,019 (-0,178/ 0,215) / 0,0005 (-0,169/ 0,170) cm in the M-D / V-O direction.

Conclusion: The reliability of dMRI for CEJ identification in vivo is comparable to CBCT. Mean accuracy of dMRI was high and slightly better in the V-O than in the M-D direction. Due to no distinction in signal between enamel and dentin in standard MRI sequences, however, a 95% confidence intervall up to 0.2 cm limits the accuracy of dMRI for CEJ identification in vivo.

155: TYPE AND SUFFICIENCY OF RADIOGRAPHIC IMAGES BEFORE REMOVAL OF MANDIBULAR THIRD MOLARS WITH A PERMANENT NEUROSENSORY DISTURBANCE

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Aim: To evaluate the type and sufficiency of radiographic images performed before removal of a mandibular third molar (M3) in a population with permanent post-operative neurosensory disturbances of the inferior alveolar nerve (IAN).

Material and Methods: Over a period of six years, 189 patients received compensation from the Danish Dental Compensation due to permanent neurosensory disturbance of the IAN following removal of M3. By consensus, two observers with access to a secure database registered type of radiographic image (intraoral/panoramic/CBCT) available before surgery. Furthermore, it was registered, if the image sufficiently displayed the whole M3 and surrounding structures including the mandibular canal (MC), overprojection/no-bony separation between M3 and MC in 2D and 3D, respectively.

Results: 104(55%) M3 were removed based on an intraoral and 54(29%) based on a panoramic. 15(8%) had both 2D modalities available. 14(7%) M3 had a CBCT. Two (1%) had no images. 22(21%) of intraorals were insufficient and no other examination was performed. Two CBCT(14%) were insufficient. 151 of M3 overprojected the MC in 2D/3D.

Conclusion: The majority of M3 was removed based on an intraoral. 12% of M3 were removed based on an insufficient intraoral. All panoramics were sufficient. Few M3 was examined with CBCT. The majority of M3 were observed overprojecting MC in 2D or with no-bony separation in 3D. It must be born in mind that the incidence of a permanent sensory disturbance is very low when interpreting the results.

157: A YOLOV5 APPROACH FOR PANORAMIC ANATOMICAL LANDMARK SEGMENTATION: AN ARTIFICIAL INTELLIGENCE STUDY

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Aim: Artificial intelligence is defined as a machine that imitates the cognitive function of the human mind. Diagnostic systems can be developed automatically on images by teaching radiographic findings to artificial intelligence-supported systems. The aim of this study is to evaluate the success of the developed artificial intelligence-supported systems in the segmentation of anatomical structures in panoramic radiographs.

Material and Methods: In this study, mandibular canal, mental foramen, foramen mandibulare, condyle, coronoid, incisura mandibularis, tuber maxilla, maxillary sinus, nasal fossa, nasal septum, hard palate, soft palate, incisive foramen, anterior nasal spine, pharyngeal airway, vertebra, hyoid bone, mandible labels are made on the panoramic radiographs obtained retrospectively. In total, 15283 labels were used as training data and 1891 labels were used as test data. Training was performed using the yolov5 architecture, and the success of the developed model was evaluated with the confusion matrix.

Results: The F1 score of all models was determined to be over 0.80, and the success rate of 11 of them was 0.90.

Conclusion: Superposition of anatomical structures in panoramic radiographs causes image interpretation difficulties, and pathologies involving anatomical structures are also seen in panoramic radiographs. Accurate detection of these structures will improve diagnostic processes.

160: RETROSPECTIVE EVALUATION OF PONTICULUS POSTICUS PREVALENCE, SELLA TURCICA TYPES, AND STYLOHYOID COMPLEX CALCIFICATIONS

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Aim: The aim of this study was to assess the incidence of ponticulus posticus and stylohyoid ligament calcification and to evaluate the morphological variations of the sella turcica within the Turkish demographic using CBCT scans.

Material and Methods: Involving a retrospective review of 460 CBCT scans and utilizing the NewTom 3G system, the study analyzed high-quality CBCT images to investigate ponticulus posticus, stylohyoid ligament calcifications, and sella turcica morphology. The ponticulus posticus was examined for complete or partial formations, while the stylohyoid ligament was classified according to its elongation and calcification patterns. The sella turcica was categorized into six distinct morphological types, enhancing the understanding of structural variations in the context of the Turkish population.

Results: The calcification patterns of the styloid processes were examined on both sides of 380 individuals, revealing the highest prevalence in the D and E categories on the right, and similar findings on the left among 373 individuals. Matching calcification patterns were more common, with 68.4% symmetry observed. For the sella turcica, category A was the most frequent among 363 individuals. Analysis of ponticulus posticus absence and presence showed a majority lacking this feature on both sides, with complete and partial forms less common.

Conclusion: The study highlights the anatomical variability and bilateral symmetry of the styloid processes, sella turcica, and ponticulus posticus, illustrating that these structures do not significantly vary with gender or age. These results hold clinical significance for the diagnosis and treatment, prompting further investigation into their impact on patient care.

161: QUANTITATIVE ANALYSIS OF MASSETER MUSCLE BY ULTRASONOGRAPHY ACCORDING TO DIFFERENT OCCLUSION TYPES USING EICHNER CLASSIFICATION

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Aim: The Eichner classification is used to classify occlusal supports in the post-canine region. The aim of this study is to investigate the effects of different occlusion types based on the Eichner classification index on the quantitative features of masseter muscle by using ultrasonography (USG).

Material and Methods: An ultrasonographic examination of the thickness and elasticity values of the masseter muscle was performed. Images were acquired bilaterally in the resting position and maximum intercuspitation (MIC). Measurements were made in edentulous patients only in the resting position. The significance level was set as $p=0.05$.

Results: This research included a total of 120 individuals aged, comprising 60 females and 60 males. According to measurements made on the right masseter muscle in both relaxed and contracted states and the left masseter muscle in a contracted state, thicknesses in females were found to be significantly lower than those in males ($p<0.01$). The thickness of the right and left masseter muscles at rest in individuals aged 55 and over was significantly less than those in the 18-35 age range ($p<0.01$). The thicknesses of the right and left masseter muscles at rest were lower in individuals in the Eichner C3 category, while in the contracted state, they were lower in individuals in the B3 and B4 categories.

Conclusion: Ultrasonography is a useful and important diagnostic method for evaluating masseter muscle without using radiation. Thickness and elasticity of masseter muscle were significantly decreased in some groups (women, aged 55 and over, and with increased tooth loss).

164: VISNOW-MEDICAL: BRIDGING THE GAP BETWEEN AI AND VISUAL INTERPRETATION IN DENTAL RADIOLOGY.

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The objective was to present the capabilities of VisNow-Medical, an extension of the VisNow-platform, specifically tailored for the visual analysis of radiological data. VisNow-Medical integrates open-source algorithms designed to enhance the analysis of radiological images with support of AI-models and simulations, making it a versatile tool for dental radiology applications.

VisNow-Medical is designed for the facilitate development of case-specific, multi-platform medical and radiological applications. It supports the processing of 1D, 2D, and 3D data across a variety of tasks including denoising, filtering, segmentation, classification, mapping, and quantitative visual analysis. The platform's functionalities are modularized, allowing users to construct complex data processing networks by linking modules together to form comprehensive applications. Various types of data are supported, differing in geometry, structure, and values. The platform offers easy integration with commonly used Python frameworks for AI modeling.

Utilizing VisNow-Medical, a novel AI-driven method was applied in quantitative MRI to assess temporomandibular-disc displacement, analyzing 50 images and revealing significant differences in retrodiscal tissue, medial pterygoid muscle, and bone marrow between groups with and without disc displacement. In CBCT, the platform aided in post-surgical analysis for lip and palate clefts in 35 patients, showing a trend towards increased alveolar volume in early secondary bone grafting cases. Moreover, VisNow-Medical facilitated the creation of 230 digital anatomical models for virtual reality.

In conclusion, VisNow-Medical significantly enhances dentomaxillofacial radiology research and development by providing a powerful, integrated platform for visual analysis with AI integration, handling diverse data and tasks.

165: IMPACT OF LITHIUM THERAPY ON JAW BONE DENSITY AND SOFT TISSUE CALCIFICATION IN BIPOLAR DISORDER: A PRELIMINARY STUDY

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Aim: Bipolar disorder is a debilitating mental illness affecting a significant portion of the global population. Lithium, a cornerstone in the treatment of bipolar disorder, raises concerns regarding its impact on secondary hyperparathyroidism and bone health in cases of long-term use. While there is conflicting evidence regarding the detrimental effects of lithium-induced hyperparathyroidism on bone integrity, a potential osteoprotective role of lithium has also been reported. This study aims to elucidate potential differences in trabecular and cortical bone density of the mandible, along with soft tissue calcification, in lithium-treated patients with bipolar disorder compared to a matched control group.

Materials and Methods: A retrospective analysis of panoramic radiographs obtained from 50 lithium-treated patients with bipolar disorder and 50 age- and gender-matched controls was conducted. Assessment parameters included the Klemetti Index for cortical bone analysis, trabecular bone pattern analysis, and identification of soft tissue calcification. All the assessments were carried out by two researchers.

Results: There was no statistically significant difference in terms of the prevalence of soft tissue calcification and Klemetti Index between the lithium-treated bipolar disorder group and the control group ($p=0.291$ and $p=0.688$, respectively). However, a significant difference was found for trabecular bone pattern analysis, indicating a denser trabecular bone structure in the mandible of lithium-treated bipolar disorder patients compared to controls ($p=0.001$).

Conclusion: This study underscores a denser trabecular bone microarchitecture in lithium-treated patients with bipolar disorder compared to the control cohort. These findings advocate for further exploration of lithium's potential bone-preserving effects in the jawbones.

166: CBCT AFTER OPG FOR HIGH-RISK WISDOM TOOTH SURGERY REDUCES PATIENT ANXIETY AND ALLOWS A BETTER UNDERSTANDING OF SURGICAL RISKS.

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Aim: To determine any additional consequences of requiring an additional CBCT after an OPG for assessment of high-risk wisdom teeth.

Methodology: A cross-sectional hospital-based study was approved by the NHS Grampians' Quality Improvement and Assurance Team. Two independent cohorts were included, one sampled when having the CBCT and the other at the time of surgery. Two short surveys were designed, validated, and administered to participants to record their anxiety levels and evaluate their experiences and perspectives on the additional CBCT scan after already having an OPG. Data analysis involved descriptive analysis for quantitative data and thematic analysis for qualitative data.

Results: Our findings are the first to show markedly reduced pre-surgical anxiety levels and improved patient satisfaction associated with having a CBCT. All participants reported that the CBCT was worthwhile and valuable, even if it resulted in a delay in undergoing surgery and a further visit to the hospital. The majority found the CBCT helpful in better understanding surgery-associated risks. One-third of participants reported a change in their treatment decision, influencing whether to opt for a total or partial wisdom tooth removal. Qualitative findings revealed that the predominant theme of patients' reported reasons for the need for additional CBCT, identified in 100% of the responses, was the assessment of wisdom tooth-nerve position.

Conclusion: In the absence of definitive evidence of the CBCT impact on the clinical outcomes of wisdom tooth surgery, our findings suggest CBCTs may be indicated where patients struggle to understand the associated risks and/or are extremely anxious.

168: ULTRASONOGRAPHIC ASSESSMENT OF MASSETER AND TEMPORAL MUSCLE DIMENSION AND INTERNAL STRUCTURE IN YOUNG ADULT PATIENTS WITH BRUXISM: A PRELIMINARY STUDY

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Objective: The goal of this study was to determine the dimension and internal echogenic pattern of masseter muscle (MM) and anterior temporal muscle (ATM) in patients with bruxism by ultrasonography (USG).

Materials and Methods: A total of 50 patients (19 males, 31 females) aged 20–28, including 25 patients with bruxism and 25 patients with nonbruxism, were included in the study. All subjects were evaluated with USG of MM and ATM. The dimension was measured at rest and during clenching and the internal echogenic pattern at rest was classified as type I, II and III. Internal echogenic pattern differences between bruxism and non-bruxism groups were evaluated using Chi-square test.

Results: In bruxism, the most common type 2 (78 %) internal echogenic pattern was found in MM and the most common type 1 (48 %) internal echogenic pattern was detected in ATM; in nonbruxism, the most common type 1 (58 %) internal echogenic pattern was observed in MM and the most common type 1 (80 %) internal echogenic pattern was determined in ATM. Whereas there was a statistically significant difference in internal echogenic pattern in the right MM and ATM in bruxism ($p < 0.05$), no significant difference was observed on the left side ($p > 0.05$). In MM and ATM on both sides, the dimensions of bruxism patients at rest and clenching were higher than those of nonbruxism patients, but this did not create a statistically significant difference ($p > 0.05$).

Conclusion: Ultrasonographic examination of the internal echogenic pattern may be beneficial in understanding the nature of the bruxism process affecting masseter and anterior temporal muscle.

170: DENTOMAXILLOFACIAL RADIOLOGY RESIDENCY PROGRAM IN INDONESIA: PAST, PRESENT AND FUTURE

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Aim: The aim of this article presentation is to present information about the journey of dentomaxillofacial radiology (DMFR) residency program in Indonesia and the possible future.

Material and methods: Dental specialists in Indonesia have been established to address the regulations and needs of dental health services, including our program which also has an important role as a professional who responsible for radiation protection. Being one of the pioneers to hold DMFR program in Southeast Asia, Indonesia until 2023 has produced more than 100 dentomaxillofacial radiologists. The residency program of DMFR started in 2008 in faculty of Dentistry Universitas Padjadjaran, Bandung with 3-years curriculum. The bureaucracy of making this study program has been a challenge, from the dental collegium, collegium of medical radiology and other stakeholders. This challenge still remains, as more dental specialist begin to establish.

Result: Currently, there are four public universities in Indonesia that have DMFR residency programs, namely Universitas Padjadjaran, Universitas Indonesia, Universitas Hassanudin, and Universitas Airlangga. Every institution has their own specific area of interest which shares the same basic competence to become Indonesian-board Dentomaxillofacial Radiologist

Conclusion: It has been almost 15 years for Indonesia to have a DMFR program, and Indonesia is among the first to adopt this program in Southeast Asia. However, the number of DMFR graduates is still limited and needed in Indonesia, Asia, and even in the bigger scoop, the world. Hence, there is a big possibility for more universities in Indonesia opening this program or others holding an international residency program.

171: ORAL MUCOSA AND SALIVARY GLANDS' RADIATION DOSE IN THREE-DIMENSIONAL TOMOGRAPHIC IMAGING OF IMPACTED WISDOM TEETH

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Objective (Aim): The aim of this study is to examine the absorption doses of the oral mucosa and salivary glands in two different cone beam computed tomography devices and different acquisition modes, resulting from 3D imaging used to evaluate the pre-surgical positions of impacted wisdom teeth and their relationships with anatomical structures.

Material and Methods: The PCXMX 2.0 software simulated the total dose received by the patient. Newtom7G and Newtom GO devices were used with different FOV areas and imaging protocols (best, regular, and low dose). CBCT images were obtained with the lowest voxel size according to the protocols.

Results: When the data obtained from both devices are evaluated, the highest absorbed radiation dose in the patient's oral mucosa and salivary gland is seen in Newtom7G's best mode. The lowest absorbed radiation dose is seen in Newtom CT-Go low mode.

Conclusion: Comparing radiation doses from images obtained in all modes, Newtom 7G caused greater radiation exposure to tissues than Newtom GO. Oral mucosa was identified as the most affected tissue in terms of radiation exposure.

173: TOP CITED ARTICLES IN ORAL RADIOLOGY: A BIBLIOMETRIC NETWORK ANALYSIS

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Aim: The purpose of the present study was to identify and analyze the 100 top-cited articles published in oral radiology journals, describe basic bibliometric indicators and analyze current research trends.

Materials and Methods: Web of Science was used to conduct a comprehensive search from inception until 22 November 2023 in dental radiology. Basic information of the 100 top-cited articles was recorded. Biblioshiny, the web interface for Bibliomterix, and VOSviewer tools were employed for conducting thematic map as well as author keyword, title, and abstract terms analysis in order to elucidate the research trends. Elsevier Scopus database was also used for citation comparisons.

Results: The total citation count for the 101 most-cited articles ranged from 105-587. The majority of them were original research studies with observational design conducted in diagnosis, dose, geometric measurements and image analysis topics. Cone beam computed tomography was the most studied radiologic technique as author keyword co-occurrence analysis revealed and appeared as basic theme for transdisciplinary research field's development. While making infant steps, artificial intelligence was adequately represented in top cited list, as it received increasing citation numbers in very few years, concentrating the highest citation densities.

Conclusions: Bibliometric analysis of the most affecting publications in oral radiology depicts the science's evolution, enhances the understanding of scientific research progress and provides dental clinicians an auxiliary guide for educational and training purposes.

174: THE EFFECT OF CBCT VOXEL SIZE ON THE ASSESMENT OF SIMULATED MANDIBULAR CONDYLAR EROSIONS: A PRE-CLINICAL STUDY

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Aim: To evaluate the effect of using two different voxel sizes on the accuracy of Cone Beam Computed Tomography in the detection of simulated mandibular condylar erosions.

Materials and methods: Twelve dry human mandibles (24 condyles) were selected and simulated erosions were drilled with variable bur sizes at different depths on the five condylar surfaces (superior, anterior, posterior, medial and lateral surfaces). The mandibles were scanned using normal and high resolution protocols (voxel sizes: 0.4mm and 0.2mm respectively).

Results: Results of the current study revealed that with the CBCT normal resolution protocol (voxel sizes: 0.4 mm), the sensitivity of detection of the simulated defects ranged from 87.05 % to 94.96 % and the accuracy values from 88.9 % to 95.86 % among the observers. However, higher values were found with the high resolution protocol (voxel sizes: 0.2 mm) where the sensitivity values increased to the range of 93.53% to 97.84 % and also did the accuracy values with range of 94.44 % to 98.15 %.

Conclusion: Both normal and high resolution protocols (voxel sizes: 0.4mm and 0.2mm respectively) were comparable in the detection of the simulated mandibular condylar erosions.

175: ARTIFICIAL INTELLIGENCE-ASSISTED SEGMENTATION OF LYMPH NODES IN THE HEAD AND NECK REGION: AN ULTRASOUND STUDY

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Aim: Lymph nodes are a crucial component of the immune system. The aim of this study is to segment inflammatory lymph nodes in the head and neck region on ultrasonography images using the YOLOv8 deep learning algorithm.

Material and Methods: This study included 218 lymphadenopathy images from 185 patients with ultrasonography images obtained for various reasons at the Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Gaziantep University. The images were polygonally labeled using Roboflow software (Roboflow, Inc., Des Moines, Iowa, USA). The labeled images were randomly divided into training, validation and test datasets.

Results: For the segmentation of lymph nodes on the test data, the true positive, false positive and false negative values for 39 lymph nodes out of 36 images were 38, 1, and 3 respectively. The accuracy of the YOLOv8 algorithm was found to be 90%. The F1 score, precision and recall values were 0.95, 0.92 and 0.97 respectively.

Conclusion: The present study demonstrated that the lymph nodes in the head and neck region can be successfully segmented using the YOLOv8 deep learning algorithm. These results suggest that deep learning algorithms have superior efficiency in the detection of various pathologies and can be used as an appropriate tool in clinical applications.

176: CAN DEEP LEARNING BE HELPFUL IN CLASSIFYING ADULT AGE GROUP WITH CROPPED RADIOGRAPHS?

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Aim: Compared to age estimation in children and adolescents, determining adult ages using dental radiographs remains a significant challenge. This study evaluated the efficacy of deep learning models in classifying adult age groups based on entire and partial panoramic radiographs (OPGs).

Material and Methods: We analyzed 785 OPGs from patients aged 20-85 years, categorized into 4-classes (15-year intervals), 6-classes (10-year intervals), and 12-classes (5-year intervals). Four deep learning models (SqueezeNet, VGG19, ResNet152, and EfficientNet) were trained on three groups: entire OPGs (Group 1), left-sided cropped OPGs (Group 2), and right-sided cropped OPGs (Group 3). We compared model accuracies for each group using entire, left, and right cropped images.

Results: All groups achieved similar average validation accuracies across classifications, with slight decreases for larger class numbers. For the 4-, 6-, and 12-classes, the highest average validation accuracies were: 80%, 75.66%, and 69.11% in Group 1; 74.39%, 75.24%, and 68.17% in Group 2; and 79.51%, 74.15%, and 61.76% in Group 3. Notably, both right and left cropped OPGs yielded comparable accuracies. Among models, VGG19 displayed the highest average validation accuracies (Group 1, 80%; Group 2, 75.24%; and Group 3, 79.51%) whereas ResNet152 displayed the lowest accuracies (Group 1, 64.77%; Group 2, 52.13%; and Group 3, 50.85%).

Conclusion: Deep learning models demonstrate promising potential for adult age classification using both entire and cropped OPGs, suggesting the possibility of utilizing separate sides of the radiograph while maintaining accuracy.

177: COMPARISON OF ORAL SQUAMOUS CELL CANCER PATIENTS ACCORDING TO HPV+ AND HPV- STATUS IN TERMS OF CLINICAL, GENOMIC AND MUTATIONS

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Aim: In integrated studies conducted in the form of comprehensive genomic analysis of oral squamous cell carcinoma (OSCC), there are significant differences according to HPV+ and HPV- status. The aim of this study is to determine differences in overall survival, genomic alterations and mutations in OSCC patients.

Material and Methods: Data from 487 samples were downloaded from the Cancer Genome Atlas data portal. Fisher Test was applied to compare the differences between mutations occurring in the form of missense, truncating, inframe and splice. The Benjamini-Hochberg procedure, automatically applied by CBioportal, was followed in the study for content and scope validity.

Results: 14.8% of the participants showed HPV+ status and 85.2% showed HPV- status. The overall survival rate was higher in HPV+ patients and a significant difference was found. Mutations occurred more frequently in HPV- patients in 85% of the 20 genes with the most frequent mutations in patients, and a significant difference was found. In the TP53 gene, where the most frequent mutation was observed, missense and truncating mutations were observed in HPV+ patients, and missense, truncating, inframe and splice mutations were observed in HPV- patients.

Conclusion: These results emphasize that both TP53 and CDKN2A driver pathways, cancer-related functional pathways in OSCC, vary depending on HPV status, and it has also been stated in studies in the literature that they may be associated with radiomic features. Therefore, this study is important in terms of forming the basic assumption of radiogenomic studies that can be planned in the future.

179: DEEP LEARNING METHOD FOR DETECTION OF RADICULAR CYSTS AND APICAL GRANULOMAS IN PANORAMIC RADIOGRAPHS: PRELIMINARY STUDY

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Aim: The aim of this study is to evaluate the performance of artificial intelligence in distinguishing radicular cyst and apical granuloma on panoramic radiographs.

Material and Methods: Panoramic radiographs were collected under three main sections: healthy, presence of radicular cyst and presence of apical granuloma, and each section was grouped within itself as 80% training data and 20% test data. 225 healthy (training: 180, test: 45), 60 with radicular cysts (training: 48, test: 12), and 164 with apical granuloma (training: 131, test: 33) radiographs were used. Artificial intelligence studies were carried out using deep learning tools in the Matlab program. AlexNet, GoogleNet and Resnet-101, which have their own deep convolutional neural network (CNN) architectures, were used as pre-trained deep learning models. No image processing or marking was done.

Results: The overall accuracy rates on panoramic radiographs were found to be 73.3%, 71.1%, 75.6% for Alexnet, GoogleNet and ResNet-101 models, respectively.

Conclusion: In this study, we tested the success rate of radicular cyst and apical granuloma detection using 3 different deep learning tools. With developing artificial intelligence and increasing studies, we believe that artificial intelligence can be a diagnostic tool to support clinicians in diagnosing lesions.

180: DETECTION OF BONE LOSS PATTERN ON PANORAMIC RADIOGRAPHS WITH DEEP LEARNING METHOD

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Aim: The purpose of this study is to evaluate the accuracy of classification of bone loss as vertical and horizontal observed in periodontitis patients using the deep learning method.

Material and Methods: Panoramic radiographs were collected under three main headings: healthy, horizontal bone loss and vertical bone loss, and each heading was grouped within itself as 80% training data and 20% test data. 225 healthy (training: 180, test: 45), 171 horizontal bone loss (training: 136, test: 35), 73 vertical bone loss (training: 58, test: 15) panoramic images were used. Artificial intelligence studies were carried out using deep learning tools in the Matlab program. AlexNet, GoogleNet and Resnet-101, which have their own deep convolutional neural network (CNN) architectures, were used as pre-trained deep learning models. Panoramic images were resized to 227*227 pixels for Alexnet and 224*224 pixels for GoogleNet and Resnet101. Apart from this, no image processing or marking was done.

Results: The success rates of reading panoramic radiographs in detecting bone loss were 74.7%, 73.7%, 74.7% for Alexnet, GoogleNet and ResNet-101 models, respectively.

Conclusion: In this study, we tested the success rate of deep learning methods in determining the bone loss pattern on panoramic radiographs. We hope that with more comprehensive artificial intelligence studies in the future, artificial intelligence can be used as a diagnostic tool to evaluate the bone loss pattern.

181: PATIENT RADIATION DOSE IN ORTHODONTICS (PRADO)

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Aim: to investigate the patient radiation dose during an episode of orthodontic treatment.

Methods: in 70 orthodontic clinics the number of X-ray exposures were retrieved for the year 2023, as well as the number of orthodontic treatment starts. These data were combined with the setting parameters of the exposures for every clinic. These parameters were linked to estimated effective patient dose. Average numbers of all types exposures per treatment were calculated per clinic and average effective patient dose per orthodontic treatment episode was calculated.

Results: 19532 treatment were commenced in 70 offices, which performed in total 52025 panoramic radiographs, 22442 lateral cephalograms, 11 PA cephalograms, 58 intra-oral radiographs and 22 CBCT-scans. The average number of exposures per treatment was 2.76 panoramic radiographs (sd 0.75; range 0.92 - 4.93), 1.15 lateral cephalograms (sd 0.26; range 0.77 - 1.98). A variety of exposure settings was encountered resulting in a range of patient dose per exposure. Preliminary results indicate the average patient dose to be between 25 uSv and 100 uSv per episode of orthodontic treatment.

Conclusions: Differences in number of exposures and exposure settings result in a large range in average patient dose during orthodontic treatment. Education and training and improvement of procedures could reduce the dose for the orthodontic patient in many of the participating offices.

182: DEEP LEARNING ALGORITHM-BASED AUTOMATIC DETECTION OF MANDIBULAR CONDYLE MORPHOLOGY IN PANORAMIC RADIOGRAPHS

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Aim: This study aims to employ the YOLO algorithm for automatic classification of mandibular condylar morphology in panoramic radiographs.

Materials and Methods: The study utilized a dataset comprising 1200 panoramic radiographs featuring 2400 healthy mandibular condyles. The data splitted into training (80%), test (10%) and validation (10%) sets. Training radiographs were annotated by two dentomaxillofacial radiologists and categorized into four classes: Round, Angled, Diamond, and Crooked Finger-shaped. Training the system involved employing the YOLOv8 model, pretrained on millions of COCO images, with adjustments made through transfer learning, hyperparameter tuning, and fine-tuning operations. Radiologists assessed the number of true positives, false positives, and false negatives based on the localization and class assignments of bounding boxes. The system's test performance was evaluated using precision, sensitivity, and F1-score metrics, while training performance was assessed through complexity matrices, performance graphs tracking epoch progression, precision, sensitivity, mean Average Precision (mAP), and training time metrics.

Results: The model achieved high precision for Angled (84.9%) and Crooked Finger (83.82%) classes, with highest recall for Crooked Finger (91.93%) and Angled (88.23%) classes. F1-Scores were highest for Angled (86.56%) and Crooked Finger (88.01%) classes. However, the model struggled with Diamond class, showing the lowest recall (54.71%) and F1-Score (65.22%). Round class had moderate precision (64.91%) and recall (77.08%), resulting in a 70.87% F1-Score.

Conclusion: The model effectively distinguishes Angled and Crooked Finger classes but faces challenges with Diamond and Round classes. Despite varied performance, the model demonstrates balanced performance overall, providing a foundation for further refinement and optimization.

183: PERFORMANCE OF AN ARTIFICIAL INTELLIGENCE SOFTWARE IN TOOTH NUMBERING IN MIXED DENTITION

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Aim: The aim of the study is to analyse the performance of artificial intelligence (AI) software in tooth numbering in mixed dentition in panoramic radiographs.

Material and methods: Seventy-eight panoramic radiographs of patients with mixed dentition were assessed for tooth numbering using the Viohl system with the software by Diagnocat Inc. (LCC Diagnocat, Miami, USA). In the next step, the results were analysed by a dentist and then compared.

Results: The applied software correctly identified deciduous and permanent teeth in 58 cases (74.35%). In 20 cases (25.64%) errors such as incorrect order of the teeth, doubled number of teeth or complete failure to identify some teeth, occurred. The errors concerned mostly deciduous teeth with advanced root resorption. There were markedly more errors in the assessment of anterior teeth than in the posterior region. AI was fully effective in identifying the presence of third molars, even in very early stages of mineralisation.

Conclusions: The used software demonstrates significant potential in identifying teeth in patients with mixed dentition, but it still requires supervision of a dentist.

185: ANALYSIS OF SPHENO-OCCIPITAL SYNCHONDROSIS FOR AGE ESTIMATION USING CONE-BEAM COMPUTED TOMOGRAPHY IN LATVIAN INDIVIDUALS

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Introduction: Spheno-occipital synchondrosis is a point of interest for forensic age estimation because of its relative late ossification in comparison to other cranial synchondroses. In literature it is reported that spheno-occipital synchondrosis fusion occur between 17 to 20 years of age. As its ossification reaches into adolescence, it has potential application for estimating 18 years of age which in many countries is the legal age. Ossification of spheno-occipital syndrondrosis could be used as additional method together with evaluation of the person-of-interest teeth deveploment and condyle deveploment.

Aim: to assess and evaluate spheno-occipital synchonsis fusion stage in relation to the real age in 14-21 year old individuals.

Materials and methods: CBCT data of 92 patients were retrospectively evaluated. CBCT were retrieved from database of RSU Stomatology institute clinic, images were taken for different clinical purposes. Spheno-occipital synchondrosis fusion was graded in 4 stages (0-3) – from completely open with no evidence of fusion till completely fused appereance of bone. Futher it was evaluated in relation to age and sex.

Results: In this study it was observed that there could be potential connection between spheno-occipital synchondrosis fusion stage and chronological age.

186: REFERENCE VALUES FOR THE ELASTICITY OF SUBMANDIBULAR LYMPHADENOPATHY CAUSED BY INFLAMMATORY DISEASES OF THE MAXILLOFACIAL REGION: A PRELIMINARY STUDY

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Aim: This study aimed to determine an average elasticity value for reactive lymph nodes by examining submandibular lymphadenopathies caused by inflammatory diseases of the maxillofacial region using shear-wave elastography (SWE).

Material and methods: The study encompassed 43 patients older than 18 years with a total of 100 submandibular lymphadenopathies caused by inflammation in the maxillofacial region. Elastography was performed on all patients using a GE Logiq S8 ultrasound machine (GE Healthcare, Little Chalfont, UK). For each lymph node, 3 circular regions of interest, each 3 mm in diameter, SWE elasticity index values were calculated from a total of 9 relevant areas obtained from 3 consecutive sections. The 9 values were averaged and reported as mean SWE.

Results: Of the patients included in our study, 22 were male and 21 were female. The mean age of all individuals was 25.90 ± 8.62 years. The mean SWE value for all participants was 21.37 ± 11.10 kPa, while it was 20.87 ± 9.95 kPa for males and 21.87 ± 12.13 kPa for females. No statistically significant difference was found between the mean SWE values of males and females ($p = 0.838$).

Conclusion: Determination of reference values for the elasticity of submandibular lymphadenopathy using SWE is expected to be a guide in the diagnosis and treatment planning of lymph node pathologies in the oral and maxillofacial region, helping to distinguish between malignant lymph nodes, reactive lymph nodes caused by inflammation and other benign lymph nodes.

187: EVALUATION OF THE EFFECTIVENESS OF A LEAD-FREE RADIATION SHIELDING HOMOPOLYMER USING CONE BEAM COMPUTED TOMOGRAPHY

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Aim: Anti-RAD is a radiation shield made of lead-free polymer. The aim of this research is to evaluate radiation protection effectiveness of anti-RAD using cone beam computed tomography(CBCT).

Material and Methods: Thermoluminescent dosimeters(TLD) were placed on the phantom body, which is the equivalent of human soft and hard tissue, in the regions representing thyroid skin and thyroid organ tissue. CBCT images with the same parameters were obtained with two different exposure protocols. The first protocol was performed without any radiation shielding. In the second protocol, a 0.5 mmPb equivalent anti-RAD was used. Each exposure protocol was repeated three times and the average of the three values was used for evaluation. Afterwards, an independent group t-test was used to evaluate whether the difference in reducing the radiation dose between the measurement results obtained from TLDs and the protocols was significant.

Results: The thyroid organ tissue absorption dose was 1.160 and 0.673 mSv for the both protocols, respectively. A dose reduction of approximately 42% with anti-RAD protection. The thyroid skin tissue absorption dose was 2.990 and 0.737 mSv for the both protocols, respectively. A dose reduction of approximately 75% with anti-RAD protection. The difference between the two protocols is statistically significant.($p=0.032$, $p=0.042$)

Conclusion: Anti-RAD product provides similar protection rate with 0.5 mmPb equivalent shields against ionizing radiation generated by a CBCT device operating with 110 kV energy. With this material, disadvantages such as environmental toxicity of lead, weight, decrease in effectiveness due to usage damage can be eliminated.

188: A NOVEL CONVOLUTIONAL NEURAL NETWORK-BASED TOOL FOR AUTOMATED SEGMENTATION OF PULP CAVITY STRUCTURES IN SINGLE-ROOTED TEETH USING CBCT

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Aim: To develop and validate an artificial-intelligence (AI)-driven tool using convolutional neural networks for automated segmentation of pulp cavity structures in single-rooted teeth on cone-beam computed tomography (CBCT).

Material and Methods: After ethical approval, a dataset comprising 69 clinical CBCT scans was retrospectively gathered from the hospital's database and divided into training (n=31, 88 teeth), validation (n=8, 15 teeth), and testing (n=30, 120 teeth) sets. Two endodontists and one dentomaxillofacial radiologist performed manual segmentation of CBCT-based pulp cavity structures to establish the ground truth, employing the Virtual Patient Creator platform (Relu, Belgium). The AI model underwent testing on 30 CBCT scans (n= 120 teeth), with the resulting three-dimensional (3D) models being qualitatively assessed and revised (R-AI) by a dentomaxillofacial radiologist. Comparative analysis involved AI, R-AI and manually segmented 3D models. Segmentation time for each method was recorded in seconds (s).

Results: The AI tool demonstrated highly accurate segmentation (Dice similarity coefficient [DSC] ranging from 89% to 93%; 95% Hausdorff distance [HD] ranging from 0.10 to 0.13 mm). AI-based segmentation outperformed human expert performance ($p < .05$), showing higher DSC and lower 95% HD values. Manual segmentation required significantly more time (2262.4 ± 679.1 s) compared to R-AI (94 ± 64.7 s) and AI (41.8 ± 12.2 s) methods ($p < .05$).

Conclusion: The novel AI-powered tool showed highly accurate and efficient automatic segmentation of pulp cavity structures in single-rooted teeth on CBCT, outperforming human expert performance. The current AI opens perspectives towards automated pulp canal segmentation in existing CBCTs for further use by dentists.

189: THE EFFECT OF RADIOGRAPHIC VARIABLES DEMONSTRATED IN CBCT ON IMPACTED ROOT DEVELOPMENT

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Aim: In this analysis we aimed to study the effect of different variables on the morphology of impacted central maxillary incisors.

Materials and Methods: We conducted a retrospective split-mouth study involving 30 patients, aged 8-30 years, with unilateral impacted maxillary incisor, observed in CBCT scans. Demographic, clinical (dental age) and radiographic data were collected. Two calibrated observers, blinded to the clinical data, evaluated anonymized CBCT scans using an objective survey tool. Radiographic measurements included: obstruction location and type, root length and volume of impacted and erupted teeth, as well as presence and angle of dilacerations, vertical location (distance to occlusal plane), tooth axis angle to ANS-PNS (sagittal inclination) and to midline (coronal inclination) of the impacted tooth. Statistical analysis was performed to compare incisor measurements and assess the impact of different variables on these measurements.

Results: The impacted incisors demonstrated significantly shorter roots ($10.2 \pm 1.8\text{mm}$ versus $13.7 \pm 1.8\text{mm}$) and significantly higher incidence of dilacerations (40% of cases), with minimal impact on root volume. A more advanced dental age correlated with shorter roots and more dilacerations. Odontomes had a greater effect on root volume than supernumeraries. A less angulated position of the impacted tooth in sagittal and coronal planes with superior position of the impacted tooth resulted in shorter roots with more dilacerations.

Conclusion: Impacted incisors, supinely located, may result in root malformation, possible due to its cortical bone proximity. Therefore, the volumetric location and the dental age of the impacted incisor may dictate the time for surgical intervention.

190: DOSE MEASUREMENT AND ANALYSIS OF THE DOSE DISTRIBUTION TO RELEVANT RADIOSENSITIVE ORGANS DURING THE PRODUCTION OF DIGITAL PANORAMIC TOMOGRAPHS

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Aim: This study aimed to provide data on the accumulated radiation doses in critical organs in the human skull. A better understanding of the exposure geometries of modern panoramic X-ray units and insights into radiation exposure profiles are crucial for optimizing radiological procedures and minimizing radiation risk to patients.

Material and Methods: The research involved direct measurement of absorbed X-ray radiation using an ionization chamber placed in a female Alderson-Rando X-ray phantom. The measurements were performed on four different panoramic X-ray units. Radiochromic X-ray films were placed in the phantom to visually display and analyze the dose distribution. The blackening patterns of the films provided information about the spatial distribution of the dose within the skull. In the following, statistical methods, such as Mann-Whitney-U-Tests, were used to derive conclusions on identified doses.

Results: The study revealed clear differences in the radiation exposure levels of various panoramic X-ray devices. In particular, one of the analyzed devices showed a significantly lower radiation exposure compared to others. In addition, the analysis of the X-ray films provided insights into the spatial dose distribution during a panoramic slice exposure.

Conclusion: The research highlights the need to carefully evaluate radiation exposure when selecting diagnostic equipment to minimize patient risks. The measured dose differences between panoramic radiographs underscore the need to refine radiological procedures. The results of this study deepen the understanding of how radiation dose is distributed in the human head and provides insights into the imaging geometries of panoramic radiographs.

192: ESTABLISHMENT OF DIAGNOSTIC REFERENCE LEVELS FOR DENTAL CONE BEAM CT IN GREECE

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Aim: This work aims to establish national Diagnostic Reference Levels (DRLs) for dental Cone Beam Computed Tomography (CBCT) in Greece.

Materials and Methods: An email survey was conducted, inviting all authorized parties with accessible email addresses to provide dose-related data from a minimum of 20 patients. The data collected included patient demographics (sex, age), referral indications selected from a predefined list, dose protocols utilized, field sizes, and reported Kerma Area Product (KAP). A total of 114 facilities responded, representing 120 CBCT scanners (50 in dental and 70 in radiology facilities), with data from 2928 patient scans.

Results: The 75th percentile values for each referral indication were successfully determined. Predominant referrals included multiple or single implant planning (40% and 17% of reported data, respectively) and impacted wisdom teeth (8%), with other indications ranging from 2% to 7%. A wide distribution of dosimetric data was observed, averaging 58%. The 75th percentile values for the most common examinations were determined as follows: 1165 mGycm² for multiple implant planning, 923 mGycm² for single implant planning, 897 mGycm² for impacted wisdom teeth, and 983 mGycm² for non-specific pathology investigation.

Conclusion: Diagnostic Reference Levels for the most common dental CBCT examinations have been established. The wide distribution in dose is likely due to the relatively recent adoption of dental CBCT as a modality. While international guidelines exist, further efforts are needed for their effective implementation.

198: COMPARISON OF 0.55T AND 1.5T MRI IMAGES OF TEMPOROMANDIBULAR JOINTS

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Aim: MRI is the gold standard for imaging soft tissues of the temporomandibular joint (TMJ). Our aim was to compare rater agreement and image quality from a dental-dedicated 0.55T scanner with images produced from a conventional medical 1.5T scanner.

Materials and Methods: Six raters evaluated 80 image stacks of TMJs from 5 participants. Images were acquired on a 0.55T scanner (Magnetom Free.Max, Siemens Healthineers, Germany) using a dental-dedicated receive coil and a 1.5T scanner (Magnetom Sola, Siemens Healthineers, Germany) using a head-neck coil. Images included: parasagittal T2-weighted and proton-density with/without fat suppression and paracoronal proton-density. Stacks were presented to raters blinded and randomized. Hard and soft tissue components of the TMJs and image quality parameters (noise, resolution, contrast) were assessed using a 3-point scale (0=unacceptable, 1=acceptable, 2=excellent). No calibration was performed: raters scored images based on professional expertise. Data was pooled across participants, pulse sequences, and side of the body. Intra- and inter-rater kappas were computed. Chi-square tests determined differences between scanners with $p \leq 0.05$.

Results: Kappa values for intra-rater agreement were 0.49-0.70 for 0.55T and 0.42-0.71 for 1.5T. Inter-rater kappa values were 0.02-0.29 and 0.02-0.23 for 0.55T and 1.5T respectively. Three raters preferred images from the 0.55T system for visualizing hard and soft tissue anatomy ($p < 0.05$). One rater preferred 0.55T image contrast.

Conclusions: Rater agreement and image quality were not different between the dental-dedicated 0.55T scanner and the conventional medical 1.5T scanner. The 0.55T scanner produced images of comparable diagnostic quality to a 1.5T scanner for evaluation of TMJs.

199: GREY VALUES BEHAVIOR OF CONE-BEAM COMPUTED TOMOGRAPHY MACHINES – AN IN VITRO STUDY

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Aim: To evaluate the grey values (GV) behavior of bone and soft tissue equivalent materials and air for varying acquisition parameters in nine cone-beam computed tomography (CBCT) machines.

Material and Methods: The DIN6868-161 phantom, composed of bone equivalent material (polyvinyl chloride), soft tissue equivalent material (polymethyl methacrylate), and air gap, was scanned in nine CBCT machines (Accuitomo 170, Axeos, Eagle 3D, Newtom VGI evo, OP300, Promax, Viso G7, X1, and X800). Exposure parameters (mA, kV), field of view (FOV) dimensions, and rotation angle (if possible) were varied. The effect of the acquisition parameters on the GV was analyzed by Kruskal Wallis test for each machine independently ($\alpha=0.05$).

Results: Altering mA did not influence on GV for any structure in five machines (Accuitomo 170, Axeos, , OP300, Promax, and X800). Viso G7 and X800 presented a decrease in the GV for increasing kV. For Promax and X1, the kV did not affect the GV. For the majority of machines, GV decreased with increasing FOV height. On the other hand, the GV in the Accuitomo 170 increased with the higher FOV. The rotation angle did not affect the GV of the Accuitomo and X800 machines.

Conclusion: The GV behavior of CBCT varies largely between the different machines and is mainly influenced by the FOV size, especially for bone equivalent radiodensity. For most machines, when the exposure parameters or FOV affect the GV, the GV decreases with the increase in the exposure parameters and/or FOV height.

201: DEEP LEARNING ALGORITHM FOR DETECTING AND CLASSIFYING DUCTOPENIC SALIVARY PAROTID GLANDS IN SIALO-CBCT IMAGES.

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Aims: Ductopenia, characterized by a reduced number of glandular ducts in parotid Sialo-CBCT scans, is considered a radiographic pattern related to Sjogren's syndrome (SjS). This study aims to assess the performance of a previously developed deep learning (DL) algorithm in classifying ductopenic parotid glands in Sialo-CBCT images.

Materials and Methods: This retrospective study involved Sialo-CBCT scans of 126 parotid glands from patients experiencing dry mouth symptoms. Three experts categorized all scans based on their duct arborization pattern into three groups: normal-appearing glands (n=63), moderate ductopenia (n=33) or severe ductopenia (n=30). The developed algorithm automatically cropped the volume containing the parotid glands and after eliminating the surrounding hard tissues the glands were segmented and split into training and testing subsets. The datasets were then augmented by rotating the CBCT scans at different angles, generating hundreds of 2D maximum-intensity-projection images for each 3D scan. Subsequently, for classifying the parotid glands, ResNet 101 DL backbone was trained and tested on the datasets.

Results: The majority (89%) of the parotid glands were successfully segmented. The DL classification algorithm demonstrated overall accuracy of 0.95, with sensitivity of 0.87 for the moderate cases and sensitivity of 0.93 for the severe cases. The sensitivity of detecting both severities of ductopenia together was 0.99.

Conclusion: We developed highly accurate DL-based algorithm for detecting and classifying ductopenic parotid gland which may aid in SjS diagnosis.

203: DEPLOYING DEEP LEARNING FOR SEGMENTATION OF CONE BEAM CT ANATOMY

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Aim: Cone beam computed tomography (CBCT) imaging plays a crucial role in dentistry, with automatic prediction of anatomical structures on CBCT images potentially enhancing diagnostic and planning procedures. This study aims to predict anatomical structures automatically on CBCT images using a deep learning algorithm.

Material and Method: CBCT images from 70 patients were analyzed. Anatomical structures were annotated using a regional segmentation tool within an annotation software (CranioCatch, Eskisehir, Turkey) by two dentomaxillofacial radiologists. Each volumetric dataset comprised 405 slices, with relevant anatomical structures marked in each slice. Seventy DICOM images were converted to Nifti format, with seven reserved for testing and the remaining sixty-three used for training. The training utilized nnUNetv2 with an initial learning rate of 0.01, decreasing by 0.00001 at each epoch, and was conducted for 1000 epochs. Statistical analysis included accuracy, Dice score, precision, and recall results.

Results: The segmentation model achieved an accuracy of 0.99 for nasal fossa, maxillary sinus, nasopalatine canal, mandibular canal, foramen mentale, and foramen mandible, with corresponding Dice scores of 0.85, 0.98, 0.79, 0.73, 0.78, and 0.74, respectively. Precision values ranged from 0.73 to 0.98. Maxillary sinus segmentation exhibited the highest performance, while mandibular canal segmentation showed the lowest performance.

Conclusion: The results demonstrate high accuracy and precision across most structures, with varying Dice scores indicating the consistency of segmentation. Overall, our segmentation model exhibits robust performance in delineating anatomical features in CBCT images, promising potential applications in dental diagnostics and treatment planning.

204: CONVERTING DOSE-AREA PRODUCT TO EFFECTIVE DOSE IN CONE-BEAM CT USING ORGAN-SPECIFIC DEEP LEARNING

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Aim: To convert dose-area product (DAP) to effective dose (ED) for cone-beam computed tomography (CBCT) using deep learning.

Material and Methods: 24,384 CBCT exposures of an adult phantom were simulated using PCXMC 2.0 (STUK, Finland), using permutations of tube voltage, filtration, source-isocenter distance, beam width/height and isocenter position. Equivalent doses for each organ used in the ICRP 103 ED calculation as well as DAP values were recorded. Next, a series of dense neural networks (NN) were trained for each organ using Keras/TensorFlow. Two methods were explored: (1) 'Coordinate' mode, which uses the XYZ-coordinates of the isocenter; (2) 'AP/JAW' mode, which uses categorical codes for the anteroposterior (AP) and craniocaudal (JAW) position. For both methods, the six aforementioned scan parameters were used as inputs as well. Each network was trained, validated and tested using a 3/1/1 data split. ED/DAP was calculated from the NN outputs using ICRP 103 tissue weighting factors, and the accuracy was compared with that of a multiple linear regression (LR) model as well as direct conversion coefficients.

Results: The mean absolute error (MAE) for equivalent dose/DAP on the test data ranged from 0.18% (bone surface) to 2.90% (oesophagus) in 'Coordinate' mode and from 2.74% (red bone-marrow) to 14.13% (brain) in 'AP/JAW' mode. The MAE for ED was 0.23% and 4.30%, respectively, for the two modes, both of which outperformed the LR model (MAE: 5.70%) and conversion coefficients (MAE: 20.19%-32.67%).

Conclusion: NNs allow for a fast and accurate estimation of patient dose based on DAP in CBCT.

207: UNUSUAL FINDINGS IN POST EVACUATION SIALO-CBCT IMAGE OF CHRONIC OBSTRUCTIVE SIALADENITIS

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Aim: Sialo-CBCT aids in diagnosis of obstructive salivary gland diseases by demonstrating the ductal system of the majorsalivary glands and by evaluation of glandular function. This case describes an unusual finding in post-evacuation image of sialo-CBCT in a patient with chronic obstructive sialadenitis.

Case presentation: A 76-year-old woman, with a medical history of CLL, hypertension and s/p breast and ovary carcinoma, presented to our department with a complaint of 2 years of recurrent swellings of the left parotid. Clinical examination revealed slight swelling of the left parotid with normal salivary milking. Sialo-CBCT scan demonstrated several strictures in the main duct without dilations, normal arborization to the 4thbranches and remarkable extravasation of iodine in the region of the parotid's accessory gland. The 5 minutes s post-evacuation image showed only 20% of contrast removal, mostly maintained in the region proximal to the accessory gland and a demonstration of an space occupying region (SOL) in the region of the parotid accessory gland.

Conclusion: The 5-minutes post evacuation image in this case diagnosed an unpredictable pathology of an SOL within the gland, byexamining the glandular activity and demonstrating the specific region of obstruction.

208: DO ALADA-DIP GUIDE OPERATORS IN CHOOSING THE CBCT PROTOCOL?

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Aim: Despite the existing radiation protection principles, guidelines are not available for the use of specific CBCT machines in particular diagnostic tasks. This study aimed to analyze the scan parameters used in our department, their correlation with patient age and reason for referral (RFR).

Materials and Methods: This retrospective study retrieved demographic data, scan protocols and radiation dose of CBCT scans performed from 2021 to 2022 for three indications: (1) impacted teeth, (2) bone lesions and (3) pre-implant evaluation. Demographic included patient age and RFR. Technical parameters included field of view (FOV), tube current, projection method, rotation type, exposure time, voxel size and dose-area-product (DAP). Statistical analysis aimed to identify correlation between technical parameters and patient age and specifically examine whether there is a specific age below which lower dose CBCT protocols are more commonly applied. It also compared the technical parameters and DAP for protocols frequently used in each RFR.

Results: The study evaluated 617 scans. Protocols with the same FOV, such as high-speed mode with full rotation and standard mode with half rotation, displayed similar DAP. Overall, DAP increased with the average age of patients, with those beyond their third decade of life more likely to receive higher radiation dose. The RFR also affected DAP, with the highest values observed in pre-implants bone assessment.

Conclusion: Patients in their first to third decades of life are more likely to be scanned with lower-dose protocols. Additional research is needed to determine whether common protocols with similar radiation doses differ in their image quality

209: EXPOSURE OF PSP PLATES WITH RED, BLUE AND GREEN LIGHT BEFORE SCANNING: DOES CHANGING ORDER AFFECT SIGNAL LOSS?

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Aim: This research aims to investigate the effect of changing the order of the colors by conducting twelve various sequences of light exposure in red, green or blue colors.

Material and Methods: Human-related material was not included. An Arduino-based experimental tool was developed with 3D printed light-tight platform. Plates were irradiated using same parameters and metallic coins were used as contrast material. The plates were exposed to red, green and blue colors, with variable color order and time interval (20 seconds, 1 second, 100 milliseconds, 10 milliseconds). Total delay before scanning and total time of light exposure was fixed, twelve sequences were conducted, and each experiment was repeated twice. Resulting radiographs were imported to ImageJ software and Signal-to-noise (SNR) and Contrast-to-noise (CNR) values were calculated by combining the ROIs dedicated for each contrast region.

Results: SNR values were found in the range of 128.6-155.6, while CNR values were found between 63.2-74.7. Second experiment (R-B-G, 20 seconds) resulted in the lowest SNR (128.6) and CNR (63.2) values, while the twelfth experiment (R-B-G, 10 milliseconds) resulted in the highest SNR (155.6) and CNR (74.7) values. For 20 seconds, administration of the red color first resulted in greater signal loss than green and blue colors.

Conclusion: Results of this experiment suggests that, despite the total delay and light exposure was the same, changing color order and time interval effected the resulting signal. Testing this phenomenon with different PSP systems or investigating the light behind it may be the subject of future studies.

210: ARTIFICIAL INTELLIGENCE SYSTEM FOR AUTOMATIC MAXILLARY SINUS SEGMENTATION ON CONE BEAM COMPUTED TOMOGRAPHY IMAGES

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Aim: The study aims to develop an artificial intelligence (AI) model based on nnU-Net v2 for automatic maxillary sinus (MS) segmentation in Cone Beam Computed Tomography (CBCT) volumes and to evaluate the performance of this model.

Material and Methods: In 101 CBCT scans, MS was annotated using the CranioCatch labeling software (Eskisehir, Turkey) The dataset was divided into three parts: 80 CBCT scans for training the model, 11 CBCT scans for model validation, and 10 CBCT scans for testing the model. The model training was conducted using the nnU-Net v2 deep learning model with a learning rate of 0.00001 for 1000 epochs. The performance of the model to automatically segment the MS on CBCT scans was assessed by several parameters, including F1-score, accuracy, sensitivity, precision, Area Under Curve (AUC), Dice Coefficient (DC), 95% Hausdorff Distance (95% HD), and Intersection over Union (IoU) values.

Results: F1-score, accuracy, sensitivity, and precision values were found to be 0.96, 0.99, 0.96, and 0.96 respectively for the successful segmentation of maxillary sinus in CBCT images. AUC, DC, 95% HD, IoU values were 0.97, 0.96, 1.19, 0.93, respectively.

Conclusion: Models based on nnU-Net v2 demonstrate the ability to segment the MS autonomously and accurately in CBCT images.

212: RADIOGRAPHIC FEATURES OF ARTERIOVENOUS MALFORMATION

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Female patient, 8 years old. Consultation for evaluation and study of zone 3.6 and 3.7.

The panoramic radiograph shows a radiolucent area of diffuse limits, multilocular that extends from the distal area of tooth 3.5, to the area near the mandibular incisure, in a caudal cranial direction it extends from the area of the marginal bone ridge to the basilar edge. Distal displacement of tooth 3.7, bulging of the marginal bone ridge, alteration of the trabecular pattern adjacent to the lesion. Entrance foramen and mandibular canal with increased caliber. Partial mesial and distal root resorption of tooth 3.6.

Cone beam computed tomography shows an oval hypodense lesion in the distal area of tooth 3.5 and caudal to tooth 3.7, of approximately 26.5 and 13.9 mm, with partially defined limits. Thinned lingual cortex.

During the biopsy the lesion presents abundant bleeding in the surgical site.

Computed tomography with contrast medium. A highly vascularized lesion is observed in areas adjacent to the medial margin of the mandibular angle, with vascular nidus dependent on the external carotid artery. The lesion extends to the masticatory and parapharyngeal space. Lesion compatible with arterio-venous malformation (AVM).

Radiologically, vascular malformations of the jaws are known as „large radiological mimics“ and can mimic another lesion, from a cyst to a malignant pathology. In the mandible, the vascular malformation produces an ill-defined radiolucent image, often with a honeycomb or soap bubble appearance, with multiple rounded areas, dilated mandibular canal and widening of the medullary spaces.

213: EVALUATION OF THE RADIATION DOSE EXPOSED TO SURROUNDING TISSUES AND ORGANS BY CBCT IMAGING OBTAINED AT LOW AND HIGH DOSES FOR DENTAL IMPLANT PLANNING

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Aim: Since its introduction in 1995, CBCT has revolutionized dental maxillofacial imaging, offering a significant advantage over conventional CT by reducing radiation doses. In dose simulation programs, effective dose and organ doses can be estimated using Monte Carlo (MC) techniques. The aim of this study is to explore the impact of low-dose and high-dose tomography scans, specifically in Cone Beam Computed Tomography (CBCT), on radiation exposure during implant measurements in the mandible.

Material and Methods: This research analyzed CBCT (Newtom 7G) images at two distinct settings: low and high doses. The study methodologically harnessed the Dose Area Product values derived from these settings, with dose performed via the PCXMC 2.0 Rotation program, incorporating Monte Carlo simulation techniques for accurate dose estimation. The Mann-Whitney U test was conducted as a statistical analysis method for comparing total doses on a tissue and organ basis.

Results: Total doses for the oral mucosa, salivary glands, skull, lymph nodes, thyroid gland, brain, bone marrow, skin, esophagus, and thymus have been obtained. In the low-dose setting, oral mucosa, salivary glands, and the skull received the highest exposure, in contrast to slight alterations in the exposure sequence at the best dose. The lowest dose values were obtained in the Thymus and Esophagus. On a tissue and organ basis, no statistically significant difference between low and high doses was detected.

Conclusion: Although no significant difference was found between high and low dose values, considering the stochastic effects of radiation, it is recommended to use the lowest possible dose values.

214: A YOLOv8 APPROACH FOR THE ANALYSIS OF DENTAL BITE-WING RADIOGRAPHS

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Aim: Bitewing radiographs allow the visualization of the entire crowns and coronal periodontal structures adjacent to the crowns of teeth in the maxilla and mandible using a single receptor. The use of artificial intelligence and related automation in the evaluation of these radiographs is beneficial in dental education and in assisting dentists in diagnosis and decision-making mechanisms. YOLO is a deep learning algorithm designed for real-time object detection. YOLOv8 is the newest version in this series and offers improved speed, accuracy and learning capacity. The aim of our study is to evaluate the success of artificial intelligence in the automation of evaluating bite-wing radiographs using YOLOv8 deep learning algorithm.

Material and Methods: A total of 11768 bite-wing radiographs were used in the study. 80% of this data was used for training, 10% for validation and the remaining 10% as test data. Training was performed using the YOLO 8 architecture in the PyTorch library. Confusion Matrix was used in the calculation of performance metrics.

Results: In total, 43585 labelings were performed. The best F1 score were found for dental pulp detection (0.98). The best sensitivity value were found for pontic detection (1) and the worst sensitivity value were found for detection of pulp stone (0.81).

Conclusion: Although there are other studies on the segmentations like in this study and this study is the only one that evaluates all these parameters together. In addition, at the literature, can seen that there is no other study using the YOLO 8 architecture.

215: THE ROLE OF CBCT IN EVALUATING THE PERIAPICAL LESION SIZE: CASE REPORT

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Aim: Highlighting the importance of using CBCT (cone beam computed tomography) in evaluating the size of periapical lesions after endodontic treatment. A follow up at 6 months.

Material and Methods: The 20 years old patient presents with periapical lesions at the level of teeth 4.1 and 4.2 caused by trauma. She benefited from rotary instrumentation taper 30/04, sodium hypochlorite irrigation 2.5% followed by laser canal sterilization 1.2 W 4 x times through circular movements after that we do root canal filling. In order to assess the size of the periapical lesions as concretely as possible we performed a CBCT examination before and after treatment the last one was made at 6 months after treatment.

Results: CBCT reconstructions highlighted the reduction in the size of the periapical lesions so that definitive crowns could be placed.

Conclusion: In the case of periapical lesions it is necessary to use CBCT examination for a correct evaluation of the dimension of the lesions.

216: CBCT OF THE JAW AND ITS USEFULNESS IN FORENSIC DENTISTRY: SCOPE REVIEW

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Aim: Determine anatomical structures of the jaw through CBCT, contributing to individual forensic identification.

Material & methods: Digital search in PubMed and Google Scholar databases with keywords in English with respective Boolean operators performed. Inclusion criteria: articles published between 2013-2023; full text; in English; related to human beings, all ethnic groups and ages. Exclusion criteria: studies performed with radiographic examinations other than CBCT; odontometric parameters; bone structures analyzed other than jaw; less than 50 patients; systematic review type studies; age an identification characteristic.

Results: 14 articles included for this scoping review. Two studies related to individual's own identity through mandibular lingual canals showed significant morphological variability in each individual. Precision rates revealed values between 96%-100% of agreement among records from the same jaw. The other 12 were carried out in 6 countries with 2,666 CBCT. From 93 parameters analyzed, 73 presented dysmorphic characteristics gender dependent. Four most common were: ramus height, minimum mandibular ramus width, bigonial width and angle mandibular. Sex determination accuracy rates between 60% and 95.1% (77.55%). Males presented higher average values.

Conclusion: Mandibular anatomical structures contribute to identify individuals, both for gender and corroborating identity. However, structures show variations between various populations and ethnicities and is not possible to establish universal dysmorphic characteristics to identify gender. Rather, it can be specified what mandibular parameters contribute in a specific population. An exception to this observation is found in the middle mandibular region, specifically in the mandibular lingual canals, which are distinctive and unique for each person, determining their identity.

218: DECODING TMJ PATHOLOGIES: HARNESSING CBCT FOR COMPREHENSIVE DIAGNOSIS

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Aim: This study aims to develop a method for decoding temporomandibular joint (TMJ) pathologies using cone-beam computed tomography (CBCT) imaging.

Materials and Methods: A retrospective analysis was conducted on CBCT scans of patients with clinically diagnosed TMJ pathologies. Radiographic features of those cases were analyzed.

Results: The developed method achieved promising results in accurately decoding TMJ pathologies from CBCT images. This approach has significant potential to assist clinicians in precise diagnosis and treatment planning for patients with TMJ disorders.

Conclusion: Cone-Beam Computed Tomography (CBCT) is instrumental in diagnosing temporomandibular joint (TMJ) pathologies by providing high-resolution 3D images that allow for the detection of subtle abnormalities such as degenerative joint disease (DJD), arthritis, and disc displacement. CBCT enables precise measurement of joint space and assessment of condylar morphology, facilitating accurate diagnosis and personalized treatment planning for patients with TMJ disorders. By offering comprehensive imaging data, CBCT empowers clinicians to formulate tailored treatment strategies, leading to improved patient outcomes.

219: CORRELATION OF CONE BEAM COMPUTED TOMOGRAPHY (CBCT) FINDINGS IN THE MAXILLARY SINUS WITH DENTAL DIAGNOSES

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A former study conducted with a total of 204 patients who underwent CBCT examinations in the university medical center Mainz between 2006 and 2008 revealed a correlation between basal mucosal thickening in the maxillary sinus and decayed posterior maxillary teeth or periodontitis. These findings are compared with a present retrospective study including the CBCT scans of 200 patients visiting a private dental office between 2014 - 2024. The setting of the studies—university medical center vs. private dental office—might introduce differences in patient demographics or severity of cases and the number of patients included in each study and their characteristics (e.g., age, gender, severity of dental conditions) could affect the reliability and generalizability of the findings.

221: DRAMATIC BONE LESION WITH MINOR RADIOGRAPHIC FEATURES IN 2D IMAGING

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Aim: We present an extensive right maxillary lesion with subtle radiographic features.

Case presentation: A 51-year-old man, otherwise healthy, presented with a one-month swelling in his right jaw, which did not improve following root canal treatment of the 1st and 2nd molars, thus he was referred to our tertiary center. Periapical radiograph demonstrated disappearance of the lamina dura in the periapical region of the adjacent teeth. Panoramic image demonstrated a lesion with subtle cortical borders causing opacification of the right maxillary sinus, resembling pneumatization. CBCT scan revealed an extensive maxillary lesion causing antral expansion and effacement of the nasal, antral and orbital borders. Histopathologic diagnosed the lesion as adenoid cystic carcinoma with perineural invasion. Treatment included surgical maxillectomy and neck dissection, followed by external radiation.

Conclusion: Radiographic changes causing asymmetry of anatomical structures should serve as an alarming sign in order to diagnose pathological lesions in their initial stages.

223: COMPARISON ON ASSESSMENT OF CARIES ON THREE DIGITAL RADIOGRAPHIC IMAGE TYPES: INTRAORAL BITEWING, CBCT, AND DIGITAL TOMOSYNTHESIS. INVITRO STUDY.

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Aim: to assess the presence and extension of caries lesions on bitewing, CBCT and digital tomosynthesis images.

Material and Method: Sixty-eight extracted permanent teeth (48 molars and 20 premolars) were included in the study. Teeth were mounted in putty to the level of enamel-cement junction in rows of 3-4 teeth, simulating a natural position in the jaw. Bitewing (BW) images were acquired with a Soredex Minray (70kV, 8mA, 0.16sec). CBCT images were acquired with a Planmeca Viso (90kV, 14mA, 8.92sec, 500x500 mm, and resolution of 0.08mm). Digital tomosynthesis (DT) images were acquired with an Adaptix prototype device (60kV, ~50µA, 0.1sec per emitter position, and slice spacing 0.25mm). Histologic standard samples were made by slicing teeth in antero-posterior direction. Caries lesions were evaluated according to presence of demineralization (yes/no), and extension of demineralization ($\leq 1/2$ in enamel, $>1/2$ in enamel, $<1/3$ in dentin, $1/3-2/3$ in dentin, $>2/3$ in dentin, in the pulp). The assessments were performed by two trained and calibrated observers. Descriptive statistics summarized the findings.

Results: K ranged from moderate to good. Accuracy, sensitivity, and specificity of the assessments of images compared to the histological assessments were statistically similar. For presence of caries the range of errors varies between 7-16% for BW, and 7-15% for both CBCT and DT. For the extent of the caries lesions, DT was characterized by the fewest errors 23%, followed by CBCT 25%, while BW led to 36% errors.

Conclusion: The accuracy of caries diagnosis is substantially affected by the radiographic imaging modality used.

224: FROM 2D TO 3D: AI-ENABLED TRANSFORMATION OF PERIAPICAL DENTAL RADIOGRAPHS INTO THREE-DIMENSIONAL MODELS

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Aim: This pilot study aimed to investigate the capability of artificial intelligence in converting 2D periapical dental radiographs into 3D models. Our focus was on determining the feasibility and accuracy of this transformation process, which can be beneficial in significant clinical scenarios where 3D tooth models are required for diagnosis and treatment planning.

Methods: We developed a custom-trained convolutional neural network (CNN) using a database of periapical dental radiographic images. Our dataset comprised 100 images, chosen for their clarity and the presence of the mandibular first molar, to target learning on a critical dental structure. This collection was divided into two segments: a training set of 70 images to educate the model and a test set of 30 images to evaluate its performance. To gauge the accuracy of our 3D reconstructions, we utilized cone beam computed tomography (CBCT) scans as ground truth. Key performance metrics—accuracy, precision, and recall—were computed from a confusion matrix to assess model efficacy.

Results: The CNN achieved an accuracy of 80% in rendering 3D dental structures, with precision and recall closely aligned with this metric. The model showed particular adeptness in delineating anatomical contours in teeth, suggesting a strong basis for further refinement.

Conclusion: This study's findings underscore the viability of using AI for 3D reconstruction from 2D radiographic images, opening avenues for enhanced clinical applications. While the initial accuracy is promising, ongoing adjustments and larger, more varied datasets are anticipated to improve model performance.

226: 3D SEGMENTATION IN CBCT: PTERYGOPALATINE CANAL

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Aim: Although pterygopalatine fossa is a small anatomic region, it is one of the crucial intersections between midfacial and cranial parts of the skull. It is a natural pathway for pathologies because of maxillary artery, maxillary branch of trigeminal nerve and pterygopalatine ganglion which were occupied in this fossa. So being an anatomical landmark for direct extension and/or perineural spread of the tumours, transmission of infections and the surgical treatment plannings makes it important for radiologists. Pterygopalatine canal connects pterygopalatine fossa to infratemporalis fossa. This study is aimed to present the automatic segmentation of pterygopalatine canal using nnUNET.

Material and Methods: Forty five dicom format cbct images with 0.200 mm and 0.400 mm slice thickness were segmented retrospectively by three trained dentists with open access 3D Slicer program. Data was categorized in two groups as 41 training and 4 test. 1000 Epoch lowres traning was performed with nnU-Netv2 architecture model. The success of our study model was evaluated accuracy, dice score, precision and jaccard index with recall.

Results: The accuracy, dice score, precision, recall and jaccard index were found respectively as 0.99, 0.603, 0.702, 0.602 and 0.45.

Conclusion: Small sample size and different slice thicknesses of the images were the limitations of this study. However, it is concluded that results encourage the use of this technique for segmentation of this deep space of viscerocranium. The present results will be a guide in learning anatomical structures in dentistry training and in the use of orthognathic surgery in dental practice.

227: DEEP-LEARNING BASED IMAGE RECONSTRUCTION TO ACCELERATE MRI SCAN TIME

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Aim: Image reconstruction methods using deep-learning (DL)-based reconstruction can be used to enable shorter MRI scan times. We assessed image quality parameters in MRI volumes reconstructed with and without DL.

Materials and methods: Twenty-seven MRI stacks from 9 healthy volunteers were reviewed by one oral radiologist in a blinded randomized fashion. TMJ images were obtained on a 0.55T scanner (MAGNETOM Free.Max, Siemens Healthineers, Erlangen, Germany) equipped with a dental-dedicated surface coil using proton density-weighted TSE sequence in the parasagittal plane with three different scan techniques: 2:38min duration accelerated with DL reconstruction at 0.24mm in-plane resolution (DL), 4:32min duration with conventional acquisition (CQ) at 0.31mm in-plane resolution (reference with similar quality), and 2:38min duration with conventional acceleration (CD) at 0.24mm in-plane resolution (reference with similar scan duration). Anatomical components of the TMJ and image quality parameters were assessed using a 3-point scale (0=unacceptable, 1=acceptable, 2=excellent). Chi-square tests determined differences between techniques (significance set at ≤ 0.05).

Results: No difference between DL and CQ were observed when scoring hard and soft tissue anatomy ($p=1.00$; $p=1.00$ respectively), while all CD images were judged unacceptable when compared to DL and CQ ($p<0.001$, $p<0.001$ respectively). All images were judged as acceptable/excellent regarding resolution and artefacts, while all CD images were rated as having unacceptable noise.

Conclusions: DL based image reconstruction enables shorter (-42%) scan times with comparable subjective image quality when compared to conventional imaging. Robustness and preservation of sensitivity in detecting pathologies of this approach must be further investigated.

228: EXPLORING PHARYNGEAL AIRWAY CHARACTERISTICS WITH NNUNET: A DEEP LEARNING APPROACH

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Aim: The pharyngeal airway is crucial in medical and dental practice, particularly for pathology identification, diagnosing obstructive sleep apnea, orthodontic evaluations, and pre-anesthetic assessments. Modern 3D techniques allow precise segmentation and volumetric analysis. Our study aims to assess a model using Cone Beam Computed Tomography (CBCT) image labels for pharyngeal airway detection.

Material and Methods: We retrospectively analyzed 188 CBCT images from our radiology archive, ensuring they showed the entire nasopharyngeal complex without motion-induced artifacts. 32022 pharyngeal airway labels were delineated by 3 dentists, verified by four radiologists. Consensus-approved labels were converted to Nifti format and trained using nnUNET architecture based Py-Torch library. Evaluation metrics included dice, precision, recall, and Jaccard score.

Results: The nnunet method, powered by artificial intelligence and deep learning, provided compelling results. A high dice score of 0.94 was achieved at both full and reduced resolutions, confirming deep learning's efficacy. Precision and recall scores, reaching 0.94 and 0.89 respectively,

Conclusion: In conclusion, nnunet, utilizing artificial intelligence and deep learning, proves effective for pharyngeal airway analysis. High dice, precision, and recall scores underscore deep learning's effectiveness in medical imaging. This study contributes insights into pharyngeal airway assessment, emphasizing AI's role in advancing medical imaging and diagnostics.

229: ESTIMATING HUMAN AGE USING MACHINE LEARNING ON PANORAMIC RADIOGRAPHS

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Aim: Age estimation is a crucial task in forensic sciences, relevant in cases such as mass disasters and legal age confirmation. In this study, AI-based models were developed and evaluated using panoramic radiographs to predict human chronological age of Brazilian patients.

Methods: From 12,818 radiographs of patients aged 2.25 to 96.50 years of both sexes, without bone lesions, fractures, or dental anomalies, 10,035 were selected after quality analysis process. The experiment initially started with a training set of 8,027 randomly selected images, representing 80% of the total dataset. To expand the dataset and improve the performance of the model, a 3-fold data augmentation technique was applied, resulting in a total of 24,081 images.

Results: The adapted InceptionV4 network effectively predicted chronological age with a mean absolute error of 3.15 and an R-squared value of 95.6%, demonstrating consistent performance on the holdout set. Two oral radiologists further evaluated the predictions of 1,282 images with a heatmap and concluded that the neural network focused on areas already used in forensic dentistry for age determination, such as pulp measurement and calcification stages of permanent teeth. The performance of the model decreased for populations over 60 years of age due to limited data on older individuals in the dataset.

Conclusion: This study highlights the potential of AI-based models for estimating chronological age from panoramic radiographs, with consistent results comparable to traditional manual methods. The next step is to adapt this network for multitask functionality, allowing simultaneous classification of sex.

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230: A RARE CASE REPORT: MULTIPLE ENDOCRINE NEOPLASIA TYPE 2B SYNDROME

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Aim: Multiple endocrine neoplasia type 2B (MEN 2B) is a very rare syndrome characterized by a very peculiar phenotype with mucosal neuromas, marfanoid habitus, and bumpy lips associated with medullary thyroid cancer (MTC) and pheochromocytoma (PHEO). It is still diagnosed too late when the MTC is metastatic, and frequently when the PHEO has already developed. This case report describes a 35-year-old patient diagnosed with Men2b syndrome.

Case Report: A 35-year-old male patient with Men2b syndrome applied to our hospital with bleeding gums and a request for a prosthesis. It was learned from the anamnesis that the patient, who has congenital Men2b syndrome, is treated and followed up regularly. In the extraoral examination, hypertrophy in the lower and upper lips, marfanoid hands, and hypertelorism were observed. Intraoral examination revealed bilateral papules in the right and left corners of the mouth, gingival hyperplasia in the upper anterior region, also hypertrophy, and multiple neuromas in the tongue. The patient was first consulted with the surgeon so that prosthetic restorations could be made. However, the patient did not agree to continue treatment due to the risk of neuroma recurrence and follow-up was recommended to the patient.

Conclusion: This case shows that knowledge of this syndrome is still insufficient and that the lack of knowledge impairs the ability to obtain an early diagnosis and cure. Because most patients with MEN 2B have no familial history, the only way to ensure a timely diagnosis is to recognize the MEN 2B phenotype on a clinical basis.

231: FULLY AUTOMATIC ASSESSMENT OF MANDIBULAR CONDYLE CHANGES

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Aim: This study proposes and validates a fully-automated assessment of volume changes in the mandibular condyle following orthognathic surgery.

Material and Methods: Two collections of cone-beam computed tomography (CBCT) scans were included in this study. The first collection included subjects with a class I occlusion and segmentations of the complete mandible. The second collection included pre-operative and post-operative CBCT scans and segmentations of the ramal segments of the mandible. Two convolutional neural networks (CNNs) were developed to predict a segmentation of the mandible and its ramal segments using a coarse-to-fine strategy. A pre-operative ramal segment was registered to the post-operative mandible. Lastly, the pre-operative and post-operative condylar volumes were determined within the same volume of interest based on the pre-operative condyle. For validation, the agreement between the fully-automated assessment and a validated semi-automated method was calculated by mean difference and intra-class correlation coefficients (ICC).

Results: Forty mandibular condyles in twenty held-out subjects (sixteen female; mean age 27.6 years) with maxillomandibular retrognathia, who underwent bimaxillary surgery, were assessed. The fully-automated method was considerably faster than the semi-automated method (3 min vs. 30 min). A small difference of the condylar volume change measurements produced by the two methods was observed (mean = 2.6%, standard deviation = 1.8%), and the agreement was excellent (ICC = 0.99). A systematic underestimation of the condylar volumes and the condylar volume change was noticed.

Conclusion: The fully-automated assessment demonstrated excellent reliability for quantifying condylar volume changes. The short processing time allows for integration into routine clinical practice.

232: DEVELOPMENT OF SIMPLIFIED WORKFLOWS FOR DENTAL-DEDICATED MRI: TECHNICAL DESCRIPTION AND USER ACCEPTANCE EVALUATION

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Aim: Present the steps to enable dental assistants to operate MRI software and perform patient scans.

Methods: Dental-dedicated MRI workflows have been developed for several applications. The dental assistant can be guided through the workflow with adopted dental nomenclature by visual elements within the MRI user interface (UI). The MRI imaging volume is positioned automatically using landmark detection. Guiding images show how the imaging volume should be positioned and how the user can interactively modify it. Some workflows focus on the teeth in one dental sextant (e.g., endodontics), and some support bilateral scanning of two sextants (e.g., TMJ). The user can interactively select the dental sextant(s) of interest at the start. We conducted two user studies: with MR technicians (n=5) and dental assistants (n=7). The user experience of the UI was evaluated with a User Experience Questionnaire (UED) on efficiency, dependability, clarity, usefulness, and perspicuity (scale -3 to +3). Task analysis of specific steps in the workflow was rated using a 4-point scale, 1: not successful to 4: successful).

Results: The dental assistants were able to run the dental workflows in the software prototype efficiently after receiving a short introduction to the UI. For the German-speaking dental assistants, the English UI language sometimes caused issues. They judged the schematic guidance as helpful. The UI received a above 2 UEQ score, on average.

Conclusion: Within the current MRI software framework, the suggested dental-dedicated MRI workflows are easy to operate by dental assistants. A user training to introduce the software is required.

233: EVALUATION OF THE DENT PERIODONTAL STATUS BY USING CT BEFORE AND AFTER RADIO AND/ OR CHEMOTHERAPY IN PATIENTS WITH ONCOLOGICAL PATHOLOGY IN THE ENT

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Aim: Comparation of the dental-periodontal status in the patient with oncological pathology in the ENT sphere in relation to the healthy one by CT examination before and after radio and/or chemotherapy.

Material and methods: Our study included 35 patients aged between 32 and 81 years who were being treated at Iasi Regional Oncology Institute with ENT cancer. Imaging exploration was performed with CT Aquilion Lightning 16- row 32 slice helical. Acquisition CT spiral nativ sagittal, coronal, axial, reconstructions in the soft tissue be acquisition with 3 mm reconstructed volume 1 mm.

Results: In principle the number and size of the periapical lesions before and after radio and/ or chemotherapy was the same with small variations.

Conclusion: It is good to clean up the oral cavity of the patients with cancer in ENT sphere before radio and/ or chemotherapy to avoid osteoradionecrosis.

235: AGE ESTIMATION AND SEX DETERMINATION BY ARTIFICIAL INTELLIGENCE IN A GREEK POPULATION STUDY: A PILOT STUDY

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Objective: This study aims to evaluate the efficacy of an artificial intelligence system to estimate the age and determine the sex in a Greek population sample.

Material and Methods: This study's sample comprised panoramic radiographs obtained from 110 adult subjects. Sex distribution was evenly balanced, (55 males/55 females) in the sample. Each subject's dental status varied. The sample's mean age was 48,87 years ($\pm 16,14$ yrs), ranging from 20 to 84 years. The methodology employed a beta version of a convolutional neural network (CNN) software developed by the University of Zagreb, leveraging ReLU and SoftMax functions.

Results: In only one case, concerning sex determination, and in 21 instances regarding age estimation, results could not be provided. The accuracy of sex determination approached 96.09%. Regarding dental age estimation, the accuracy appeared to be at 60%.

Conclusions: This fully automated analysis of panoramic images, requires no specific criteria for images and imposes no restrictions on the ethnic background of the subjects. With an accuracy of 96.09%, the results for sex determination were considered particularly satisfactory. It seems that the image quality, the number of teeth, and the number and kind of dental treatments may affect the accuracy of this software. The current limitations of this software are that it was trained on orthopantomograms of the Croatian population and that all images used for training were made on only one type of X-ray device. For even better results in the training process, orthopantomograms from different devices and populations should be used.

238: DENTAL MATERIALS ARTIFACTS IN MRI - AN IN VIVO RETROSPECTIVE STUDY

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Background: Magnetic resonance imaging (MRI) aids in diagnosing pathologies in the head and neck region. Artifacts due to dental materials might affect the ability to diagnose pathologies.

Dental materials in MRI lead to signal loss artifacts. Those artifacts will appear as black areas which may interfere with the diagnostic value in the areas of interest. Orthodontic appliances produce MRI artifacts and have been widely studied in vitro.

Aim: To investigate artifacts produced by various dental materials on MRI in vivo.

Materials and methods: Files of 50 patients under the age of 18, and 50 patients above 18 years treated in our department will be retrieved. Data regarding each patient's dental treatment will be gathered from clinical and radiographic examinations. An experienced head and neck radiologist blinded to the patient's dental data will examine the MRI and record the artifacts. Artifacts will be described in terms of location, size, and influence on the diagnostic value at the area of interest.

Results: Our preliminary results show that MRI signal loss produced by dental materials usually affects the close vicinity and does not alter diagnostic value in the area of interest in most cases. The most prevalent dental materials that cause artifacts other than orthodontic appliances are Preformed and PFM crowns.

Conclusions: MRI artifacts produced by dental materials reduce the diagnostic value mainly in the nearby structures. Despite the distortion produced by those dental materials, in most cases, it didn't interfere with the interpretation of the MRI scan.

239: ARTIFICIAL INTELLIGENCE IN FORENSIC DENTISTRY IDENTIFICATION. A SYSTEMATIC REVIEW

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Aim: The aim of this systematic review is to evaluate the scientific evidence concerning the implementation of Artificial Intelligence in Forensic Dentistry Identification.

Material and Methods: An electronic systematic literature search was conducted according to the PRISMA guidelines by using four electronic databases; PubMed, Web of Science, Scopus, and Cochrane Library for articles published from January 2014 to March 2024. The essential information was recorded using a predefined data extraction form. The Cochrane method of bias: ROBINS-I tool was applied to assess the quality of evidence.

Results: Initially, 579 articles were retrieved, after the duplicate removal of 350 articles, the remaining 229 were assessed for their relevance to our research question. Studies were evaluated based on inclusion and exclusion criteria, by which 83 articles remained by title and 59 articles remained by abstract. Finally, 50 articles were eligible for this systematic review via full text reading. The following AI methods are included in this systematic review: convolutional neural networks, machine learning algorithms, and hybrid models. AI methods demonstrate high accuracy rates: the highest accuracy rate was 95% for age estimation, 95.2% for gender estimation, 100% for dental chart identification, 98.27% for segmentation, and 98.9% for identification based on dental implants.

Conclusion: This systematic review supports the importance of AI in Forensic Dentistry Identification. The implementation of AI techniques in forensic dentistry introduces a new era of innovation, offering a synergy of human expertise and technological capabilities. Further high-quality research is needed to verify the outcomes of this systematic review.

243: YOLOV8 ALGORITHM FOR PREDICTING TOOTH NUMBERING AND DIAGNOSIS OF DENTAL TISSUE, RESTORATIONS, AND LESION PATTERNS IN PERIAPICAL RADIOGRAPHY

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Aim: This study explores the feasibility of predicting tooth numbering, dental tissue (pulp), restorations (filling, root canal filling, crown, pontic), and pathologies (caries, apical lesions) in periapical radiographs using YOLOv8 algorithms.

Material and Methods: The images in our archive obtained which was prescribed for various reasons in our clinic, were examined for the study. In total, the numbering of the teeth in the imaging area was done on 14624 labels. Then, dental pulp, filling, root canal filling, crown, pontic, caries, and periapical lesion labeling were performed. All these procedures were performed at different times by 3 dental radiologists using CranioCatch software (Eskişehir, Turkey). Deep learning was performed using the YOLOv8 model implemented with the Pytorch library. 80% of the data was reserved for training, 10% for testing. In total, 28678 of the labels were allocated for training and 3592 for testing. The performance of the generating model was evaluated by calculating the sensitivity and precision values and the F1 score using the true/false positive/negative numbers obtained from the confusion model.

Results: Metrics reveal that the created model has high performance. Sensitivity and precision values were found to be above 74.2% and 93.6%, and the F1 score was above 84.1% for all labeling,

Conclusion: The study findings indicate that the developed model exhibits high potency and acceptable success in detecting tooth number, dental tissue, restorations, and pathologies on periapical radiographs. This underscores the potential of artificial intelligence-supported applications in dental radiology education and doctor-patient communication.

245: CHRONOLOGICAL AGE ESTIMATION WITH PANORAMIC RADIOGRAPHS USING PREDICTIVE FORMULA AND NEURAL NETWORK: A COMPARATIVE ANALYSIS

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This study aimed to compare a predictive formula and a deep neural network in estimating chronological age in panoramic radiographs (PR). A total of 2,533 images from patients aged 2 to 22 years were utilized, sourced from the database of the Dental Radiology Clinic at UFPE, Recife, PE, Brazil. Of these images, 2,219 were employed for training and validating a neural network model with the Inception V4 architecture, following interactive concepts of the CRISP-DM structure. The remaining 314 PRs were used in the neural network's testing phase to assess its efficacy in age estimation. For the evaluation of the predictive formula, an experienced and calibrated radiologist assessed the same 314 images for the third molar development degree according to Demirjian et al.'s (1973) classification, with stage zero added for crypt presence. The data underwent descriptive and Bland-Altman analyses with Student's t-test to assess the mean difference between the estimated and real ages ($p \leq 0.05$). The neural network model exhibited a mean absolute error (MAE) of 1.043 years, a mean squared error (MSE) of 1.769 years, and a mean difference compared to the real age of 0.07 ($p = 0.37921$). The predictive formula displayed higher MAE values (1.521 years), MSE (4.105 years), and a mean difference between estimated and real ages of 0.97 ($p \leq 0.05$). In conclusion, the predictive formula cannot be used as the sole method for age estimation and the Inception V4 architecture's age estimation through this neural network model can be considered similar to the real age.

247: THE PREDICTION MODELING OF BENIGN JAW PATHOLOGIES USING DEEP LEARNING WITH NNUNET ARCHITECTURE

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Aim: To address a gap in current literature, we evaluated the use of deep learning in detecting benign jaw pathologies in cone beam computed tomography (CBCT) images.

Material and Methods: In this study, we retrospectively examined images retrieved from archives using various devices. Images with a slice thickness <1 mm, ensuring adequate lesion visualization, were selected for detailed evaluation of jaw pathologies. Total 355 stack images underwent manual segmentation, with lesions labeled across axial sections by three dentists using CranioCatch software (Eskisehir, Turkey). Both general (benign jaw pathology-BJP) and specific (radicular-RC and dentigerous cyst-DC) labeling procedures were conducted. A total of 20,925 pathologies were labeled, including 20,925 benign jaw pathologies in 305 images, with 13,799 radicular cysts in 305 images and 1,966 dentigerous cysts in 33 images. The accuracy of labels, confirmed by consensus among three different maxillofacial radiologists, underwent training. Files were then converted to Nifti format, and training was performed for 1000 epochs using the nnUnet architecture. The model's performance was evaluated using precision, recall values, and Dice and Jaccard scores.

Results: Dice scores, precision and recall values, and Jaccard scores were obtained as 0.70-0.76-0.72-0.61, 0.70-0.72-0.75-0.60, and 0.72-0.82-0.71-0.61 for BJP, RC, and DC, respectively.

Conclusion: The highly successful results of our study, which represents a pioneering study in this field, are promising in filling a critical gap as it is potentially the first research on the detection of benign jaw pathologies using artificial intelligence on CBCT images.

248: A WORKFLOW- AND PATIENT-COMFORT OPTIMIZED DENTAL-DEDICATED MRI COIL: TECHNICAL CHARACTERIZATION AND USER ACCEPTANCE EVALUATION

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Aim: A dental-dedicated MR receive coil is proposed with optimal anatomical coverage, high sensitivity in the dentomaxillofacial (DMF) region, highest patient comfort and ease-of-use to facilitate clinical dental MRI at 0.55T with diagnostic quality in short examinations.

Material and Methods: Aiming for openness, reduced patient motion and easy handling & hygiene, a dental MR receive coil was developed with an asymmetric holder mechanism (RAPID Biomedical GmbH, Rimpar, Germany). The coil array consists of an arrangement of seven coil elements in a row, combining a rigid central element with an opening for the nose and mouth, and flexible flaps containing three more coil elements on each side to cover the DMF region. The mechanical holder structure enables precise positioning of the coil in close vicinity of the patient's face and adjustment of height and angulation in proximity to the patient jaw. The coil was characterized regarding SNR vs. standard head-neck coil, patient and operator perception and diagnostic performance.

Results: High quality imaging of the DMF region could be performed in short exam times at 0.55T with the dedicated coil. Feedback on patient and operator perception was overall very positive. The relative signal-to-noise was shown to be comparable or higher in the relevant DMF structures compared to a standard head/neck coil, but lower in the brain region (SNR condyles: 341%, mandibular bone: 191%, sella: 91%, brain: 29%).

Conclusion: It is feasible to perform diagnostic dental-dedicated MRI at 0.55T with short scan times at high patient comfort using a dedicated dental coil.

249: ARTIFICIAL INTELLIGENCE IN PANORAMIC RADIOGRAPHY INTERPRETATION: A GLIMPSE INTO THE RADIOGRAPHIC EXAMINATION OF THE FUTURE

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Aim: The objective of this study is to develop a deep learning algorithm based on YOLO-v8 for the purpose of diagnostic charting in panoramic radiography, followed by a comprehensive evaluation of its performance.

Material and Method: Panoramic radiographs were labelled using CranioCatch labelling software (Eskisehir, Turkey) in various categories including adult tooth numbering, caries, unerupted/impacted tooth, fillings, overhanging fillings, root canal filling, periapical lesions, residual root, alveolar bone loss, vertical bone loss, horizontal bone loss, furcation defect, dental implant, fixed prosthesis (pontic, crown, implant-supported crown), jaw pathology and dental pulp. The model was trained using 389056 labels and tested using 48346 labels. A YOLO-v8 model was used for developing Artificial Intelligence (AI) model for each labelling. Confusion matrix was used to success evaluation of AI models.

Results: The performance metrics for the developed model were as follows: precision/sensitivity/F1-score for adult tooth numbering (0.99/0.99/0.99), fillings (0.99/0.97/0.98), vertical bone loss (0.77/0.68/0.72), dental implants (0.99/0.99/0.99), horizontal bone loss (0.98/0.86/0.93), dental pulp (0.99/0.97/0.98), furcation defects (0.91/0.87/0.89), fixed prostheses (0.97/0.96/0.97), root canal fillings (0.99/0.98/0.99), alveolar bone loss (0.94/0.86/0.90), jaw pathologies (0.93/0.78/0.85), periapical lesions (0.96/0.66/0.78), residual roots (0.93/0.97/0.95), caries (0.95/0.91/0.93), unerupted/impacted tooth (0.85/0.96/0.90), and overhanging fillings (0.86/0.91/0.89).

Conclusion: Upon scrutiny of the outcomes derived from the developed models, it is discerned that convolutional neural network-based AI exhibits a notable capacity to identify various conditions encountered during routine clinical examinations in panoramic radiographs, demonstrating high performance. Aligned with these findings, it can be asserted that AI holds substantial promise for physicians in enhancing routine clinical practices.

250: MULTIPLE ODONTOGENIC KERATOCYSTS IN A NON-SYNDROMIC PATIENT: AN 8-YEAR FOLLOW-UP

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Aim: Although odontogenic keratocysts (OKC) are common in the jaws, multiple occurrences are rare and are often associated with syndromes such as nevoid basal cell carcinoma syndrome (NBCCS). In this case report, an 8-year follow-up of a patient with multiple OKCs recurring in a patient who did not show any syndromic features is presented.

Material and Methods: Upon referral, a male patient aged 15 years presented with unicystic lesions localized in the bilateral mandibular and maxillary molar regions, later diagnosed as OKCs. Recurrences were observed four years later in the right mandibular molar region and eight years later in the right maxillary sinus, alongside emerging lesions in the pericoronal regions of the mandibular third molars. Following the excision of all recurrent lesions, a diagnosis of OKC was affirmed. Given the significant risk of recurrence, mutational analysis of the PTCH1 gene was carried out.

Results: The patient was examined through any possible link of inheritance and clinical features of NBCCS. No relevant findings were identified, and genetic testing for PTCH1 revealed no mutations associated with NBCCS. The patient is being followed up for possible new recurrent lesions.

Conclusion: This case presents multiple OKCs with frequent recurrences, which is an indicative feature of NBCCS. Consequently, it is important to conduct a thorough histopathological examination to identify any other existing lesions. Furthermore, a comprehensive clinical evaluation should be undertaken, followed by long-term monitoring.

251: FRACTAL ANALYSIS OF MANDIBULAR BONE STRUCTURE AFTER RADIOTHERAPY: A COMPARATIVE STUDY

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Aim: The effects of radiation on bone tissue and the mechanisms of osteoradionecrosis (ORN) are not fully understood. Fractal analysis (FA) quantifies complex structures and fractal dimension values describe bone quality. The aim of this study was to investigate the effect of radiotherapy on mandibular bone tissue in patients without ORN who had gone radiotherapy for head and neck cancer using FA.

Materials-Methods: Panoramic radiographs (OPG)s of patients who had undergone radiotherapy (RTG) were retrieved from archives of Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Kocaeli University between 2019 and 2023. OPGs with any signs of ORN were excluded. Control group (CG) was formed with age and sex matched healthy patients. FA was conducted on the OPGs with the box-counting algorithm in three regions of interests (ROI) as ROI1: the upper part of the ramus, ROI2: the angulus and ROI3: the anterior part of the mental foramen.

Results: A total of 27 OPGs of RTG and their 27 age and sex matched OPGs of CG were analysed. Although FA was lower in RTG compared to CG in ROI2 and ROI3, there was no significant difference between the FA values of RTG and CG ($p>0.05$).

Conclusion: Our results indicate that there was no significant difference in the evaluation with FA to differentiate radiographic trabecular changes between patients receiving head and neck radiotherapy and their controls. Further studies with larger populations are required to explore FA's role in detecting osteoporotic changes in these patients before ORN.

252: AN MRI INVESTIGATION OF TEMPOROMANDIBULAR JOINT DISORDERS AND HYPERTROPHIC UVULA PALATINA: IS THERE A LINK?

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Aim: Temporomandibular joint disorders (TMD) encompass a range of conditions affecting the jaw joint and surrounding muscles. While the etiology of TMD is multifactorial, a potential association with anatomical structures in the oral and pharyngeal region, including the uvula palatina (UP) should be examined.

Materials and Methods: Turbo Spin Echo Magnetic Resonance Imaging (TSE MRI) scans of patients diagnosed with TMD were retrospectively examined. UP dimensions were assessed and classifications made based on mediolateral dimensions into hypertrophic (H) and non-hypertrophic (NH) categories. Additionally, patients with TMD were evaluated for articular disc position, categorized as displacement with reduction (DWR) or displacement without reduction (DWOR). Statistical analysis was conducted for categorical variables with a statistical significance defined as $p < 0.05$.

Results: A total of 58 MR images (43 female, 15 male) were assessed, with 34 patients exhibiting DWR. The mean mediolateral dimension for UP was measured at 6.78 mm for patients with DWOR and 7.59 mm for those with DWR. The statistical analysis did not reveal a significant relationship between uvula dimensions and disc displacement ($p < 0.05$).

Conclusions: UP dimensions may be influenced by various factors, including anatomy and soft tissue structure within the pharyngeal region. While this study hints at a potential link between uvula morphology and TMD, further research with larger sample sizes and comprehensive evaluation of airway structures is warranted for a more definitive assessment of the relation between TMD and size of the UP.

253: EVALUATING THE EFFICACY OF AN ARTIFICIAL INTELLIGENCE IN SEGMENTING DIVERSE DENTAL CONDITIONS IN CONE BEAM COMPUTED TOMOGRAPHY

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Aim: The objective of this study is to develop a deep learning algorithm (DL) based on nnU-Net v2 that can diagnose various dental conditions that may occur when examining cone beam computed tomography (CBCT) volumes.

Material and Method: Three-dimensional segmentations were made on the CBCT volumes in different ways as caries, filling, residual root, fixed prosthesis (crown/pontic), root canal filling, periapical lesion, impacted/unerupted teeth, dental implants, endodontic-periodontal lesions, implant-supported crowns using the CranioCatch software (Eskişehir, Turkey). As a result of the segmentations made for each condition, each group was divided into 90% training and 10% test groups according to the number of labelling. A DL based on nnU-Net v2 was developed separately for each model and the success of the model was evaluated using Dice Score, Precision, Recall and Jaccard Index.

Results: When evaluating the success of the developed models, Dice Score, Precision, Recall, and Jaccard Index values for different dental conditions were determined as follows: for caries, 0.48, 0.54, 0.55, 0.35, respectively; for filling, 0.73, 0.72, 0.76, 0.60; for residual root, 0.62, 0.70, 0.56, 0.53; for fixed prosthesis, 0.72, 0.81, 0.67, 0.61; for root canal filling, 0.71, 0.81, 0.69, 0.57; for periapical lesion, 0.56, 0.65, 0.56, 0.44; for impacted/unerupted, 0.61, 0.59, 0.84, 0.53; for dental implant, 0.85, 0.85, 0.85, 0.74; for endodontic-periodontal lesion, 0.39, 0.92, 0.34, 0.32; and for implant-supported crown, 0.85, 0.85, 0.85, 0.74, respectively.

Conclusion: The application of the nnU-Net v2-based DL gives promising results in the automated segmentation of various dental conditions observed in CBCT volumes.

254: YOLO-V5 BASED DEEP LEARNING APPROACH FOR TOOTH DETECTION AND SEGMENTATION ON PEDIATRIC PANORAMIC RADIOGRAPHS IN MIXED DENTITION

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Aim: In the interpretation of panoramic radiographs, the identification and numbering of teeth is an important part of the correct diagnosis. This study evaluates the effectiveness of YOLO-v5 in the automatic detection, segmentation, and numbering of deciduous and permanent teeth in mixed dentition pediatric patients based on panoramic radiographs (PRs).

Methods: A total of 3854 mixed pediatric patients PRs were labelled for deciduous and permanent teeth using the CranioCatch labeling program. The dataset was divided into three subsets: training (n=3093, 80% of the total), validation (n=387, 10% of the total) and test (n=385, 10% of the total). An artificial intelligence (AI) algorithm using YOLO-v5 models were developed.

Results: The sensitivity, precision, F-1 score, and mean average precision-0.5 (mAP-0.5) values were 0.99, 0.99, 0.99, and 0.98 respectively, to teeth detection. The sensitivity, precision, F-1 score, and mAP-0.5 values were 0.98, 0.98, 0.98, and 0.98, respectively, to teeth segmentation.

Conclusions: YOLO-v5 based models can have the potential of to detect and segmentation of deciduous and permanent teeth accurately in PRs of pediatric patients with mixed dentition.

255: INVESTIGATION OF ENDODONTIC TREATMENTS IN CENTRAL ANATOLIA BY CONE-BEAM COMPUTED TOMOGRAPHY

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Aim: This study aimed to ascertain the prevailing prevalence and quality of endodontic treatments, examining their correlation with various factors influencing periapical status within a Turkish subpopulation.

Material and Methods: The retrospective analysis involved Cone-Beam Computed Tomography (CBCT) images of 208 patients (82 males, 123 females; mean age 44.53 ± 14.82 years) attending Necmettin Erbakan University Faculty of Dentistry between 2022 and 2024. Among 5740 examined teeth, 525 met inclusion criteria after undergoing root canal treatment. The relationship between periapical status and the quality of root canal treatments was assessed using a modified CBCT periapical index (PAI) by a singular observer. Statistical analysis, employing the chi-square test, investigated the association between periapical status and the quality of root canal fillings (RCFs).

Results: Apical periodontitis (AP) prevalence among teeth with RCF was 80.1%, while overall endodontically treated teeth represented 9.14% of the total. AP prevalence was notably observed in teeth with short RCF (64.32%), overextended RCF (63.6%), inadequate RCF (45.2%), and untreated root canals (35.7%). Procedural errors in root canal obturated teeth (overlooked canal, perforation, step formation) were significantly associated with AP (77.5%). No statistically significant gender-based differences were identified concerning AP ($p>0.05$). AP was more frequent in teeth treated with procedural errors.

Conclusion: This study underscores a suboptimal quality of root canal treatment within the examined Turkish subpopulation, indicating a compelling need for enhancements in the technical proficiency of endodontic procedures.

256: TAILORING THE EXAMINATION WORKFLOW IN DENTAL-DEDICATED MRI

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Aim: To develop an optimized examination workflow for dental-dedicated MRI by minimizing examination durations without compromising on image quality and diagnostic value.

Material and methods: Healthy volunteers were examined using a 0.55T scanner (MAGNETOM Free.Max, Siemens Healthineers, Erlangen, Germany), equipped with a dental-dedicated 7 channel array coil.

Examination workflows for three dental indications (temporomandibular joints (TMJ), orthodontics, tooth extraction) were created using optimized MR pulse sequences (2D: 6x6 cm² FOV, in-plane resolution 0.3x0.3mm² and section thickness 2 mm, proton-density-weighted turbo spin-echo sequences including deep-learning based image reconstruction; 3D: 15x18x18cm³ proton-density-weighted SPACE with compressed sensing and denoising, resolution 0.5x0.5x0.5mm³). Automatic view planning software was integrated in the workflow to reduce time-consuming user interactions. Overall examination times and nominal signal-to-noise (SNR) were assessed.

Results: Examinations could be completed within 15 minutes with diagnostic image quality (TMJ: 13:11 min, orthodontics: 11:52 min, tooth extraction: 14:28 min). The SNR in the clinical scans was sufficient in the relevant dentomaxillofacial structures, as confirmed by a dental radiologist (SNR condyles: 15.1, mandibular bone: 23.8, sella: 11.3, pulp: 13.4, brain: 3.1).

Conclusion: With the tested dental-dedicated workflow setup, including automated view planning and optimized sequences, examinations with diagnostic image quality can be performed in clinically acceptable examination times of less than 15 minutes. Shorter examination times contribute to better patient cooperation, which is generally beneficial for MR image quality. The tailored workflows with short examination times may improve acceptance of dental-dedicated MRI in dentistry.

257: FOCUSING ON THE DENTOMAXILLOFACIAL REGION IN DENTAL-DEDICATED MRI WORKFLOWS

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Aim: To test a set of technological features enabling a trained operator to perform focused dentomaxillofacial (DMF) MRI, without compromising on diagnostic image quality.

Material and Methods: A combination of methods to limit the imaging volume to the DMF region were implemented on a dental-dedicated 0.55 T MRI system (MAGNETOM Free.Max, Siemens Healthineers AG, Germany). These included the use of a dedicated surface coil, automated image volume positioning and optimization of scan parameters for a small field-of-view coverage, e.g., 6.0x6.0x2.5cm³, i.e., for tooth-specific and TMJ sections. To further ensure the focus on DMF also in larger FoV scans, as used in orthodontic applications, explicit 3D image volume restriction, positioned relative to cephalometric landmarks detected in scout images, was employed. For this purpose, an algorithm was trained ("AdaBoost", n=70 volumes) to automatically detect these landmarks. The performance of the algorithm was assessed in an additional 133 subjects, including instances where metal artefacts due to retainers and prostheses were present.

Results: 3D image volume restriction was successful in 130/133 test cases. Even in cases with metal artefact, results were judged as acceptable, as the relevant landmarks were not affected. Detection quality was rated very good in 87.2%, good in 9.8%, marginal in 0.8% and failed in only 2.2% due to severe metal artefacts.

Conclusion: Focus in dental MRI using landmark detection in scout MR images is feasible and will enable time-efficient exams with dental-diagnostic image quality in dental-dedicated MRI.

260: ENHANCING OSTEOPOROSIS SCREENING WITH EFFICIENTNET-BASED MODELS FOR PANORAMIC DENTAL IMAGES

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Aim: To develop a method for screening osteoporosis on panoramic radiographs (PRs) using convolutional neural network (CNN) models built on the EfficientNet architecture.

Material and methods: Two approaches were explored: using complete PR images and using cropped PR images that specifically focus on the mandibular cortical region. The image database consisted of 750 PRs, 579 were classified as C1 and 171 were annotated as C3 by an experienced examiner. An in-house platform named Gigaview was developed to gather, process, and view data. The study used the Computer Vision Annotation Tool (CVAT) for image annotation and dataset preparation, integrating data preprocessing techniques such as the Rolling Ball method for noise reduction and background correction, and also data augmentation techniques. The EfficientNet B5, B6, and B7 models were fine-tuned using transfer learning classification techniques. The metrics were Accuracy, Precision, AUC Score, Recall, F1-Score, and Specificity.

Results: The cropped-image approach achieved an accuracy of approximately 98% and AUC of 0.987 (EfficientNet B7), while the full-image approach yielded a slightly lower accuracy of approximately 95% and AUC of 0.961 (EfficientNet B6). The incorporation of Grad-CAM enabled a more detailed visual analysis, particularly highlighting the significance of the mandibular cortical edge in model predictions, even with the utilization of the full-image method, despite its slightly lower performance compared to the cropped-image approach.

Conclusions: This study contributed to computer-aided diagnosis in dentistry by making the codes used for training and testing the networks publicly available, thereby offering a promising tool for osteoporosis screening in routine PRs.

261: 3D TOOTH SEGMENTATION WITH NN-UNET: AN ARTIFICIAL INTELLIGENCE STUDY

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Aim: Three-dimensional radiographs are difficult to interpret and require special expertise. In addition, situations such as human misinterpretation may occur. The

development of systems in which anatomical and pathological structures are automatically analyzed is a necessity of the age. In this study, we aimed to evaluate the success of artificial intelligence models developed in the segmentation and numbering of teeth on CBCT images.

Material and Methods: In this study, CBCT images taken from our radiology archive were examined retrospectively. A total of 50 stacked images were included for manual segmentation of teeth in CBCT images. Teeth were labeled polygonally along the axial section using CranioCatch software by three experienced radiologist. DICOM files were converted to Nifti format using nn-Unet architecture, Epoch lowres training was performed 1000 times using the nn-Unet architecture. The models performance was evaluated using precision, recall values, as well as Dice and Jaccard scores.

Results: In this study; a total of 255324 tags were performed. The highest dice scores obtained after segmentation were 0.92 for teeth 36 and 23, and the lowest was 0.52 for teeth 25.

Conclusion: Recent research highlights the effectiveness of AI in detecting 2D dental radiographs with high accuracy. However, studies on 3D analyzes are few and most of the studies automate frame-based analyzes instead of 3D segmentation analysis. In this study, successful results were obtained in 3D segmentation of the location and numbering of teeth using nn-Unet. No New U-Net methodology in dental AI research signifies a shift towards optimizing existing U-Net architectures with innovative enhancements.

262: IMAGING DIAGNOSIS OF TUMOR MASSES IN THE NASAL CAVITIES IN CHILDREN AND YOUNG ADULTS

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Aim: Tumor masses in the nasal cavity are quite common. They can have various etiologies: congenital, inflammatory, infectious, traumatic or malignant. Very few of these etiologies are unique to the pediatric population such as encephalocele, nasal glioma, juvenile nasopharyngeal angiofibroma. s.a. The purpose of this study is to present the imaging aspects encountered in nasal cavity lesions in children and young adults in the NE region of Romania.

Material and Methods: In the last two years (Jan. 2022- Jan. 2024), a total of 123 paediatric patients were addressed to Medimagis Clinic for further imagistic investigations. We analysed 50 patients via CBCT, 60 patients with computer-tomography, and we complete this study with 13 paediatric patients in MRI Emergency N. Obu Hospital registers for a period of 5 years .

Results: Non-neoplastic disorders were identified in 62 female patients and 48 male patients mostly with infectious, inflammatory and traumatic lesions. Only 6 male patients had juvenile nasopharyngeal angiofibroma, two nasal pleomorphic adenoma, one infantile hemangioma and only 7 cases had malignant neoplasm- two rhabdomyosarcoma, two lymphoma, one nasopharyngeal carcinoma, one metastatic disease and one esthesioneuroblastoma.

Conclusion: CBCT and CT scan are essential in evaluating congenital, inflammatory, traumatic or tumor lesions to reveal bone extension of the lesion. MRI examination is essential for characterizing the tumor mass and perineural extension of the neoplastic disorders.

263: 3D JAW BONE SEGMENTATION WITH ARTIFICIAL INTELLIGENCE

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Aim: In implant planning and guide production, the distance of the crests to the anatomical areas is taken as basis. Deep learning is a subset of artificial intelligence where algorithms are designed to mimic the structure and function of the human brain to process data and make decisions. In dentistry, deep learning plays a crucial role in image analysis, treatment planning, and patient care. The aim of this study is to evaluate the success of artificial intelligence models in three-dimensional automatic segmentation of the maxillary alveolar bone and mandible.

Material and Methods: In the study, 34551 labels were made on 165 dicom images. 90% of the data is allocated as training and 10% as testing. Trainings were carried out with nn-Unet. The success of the models was determined by the dice score.

Results: The dice score was found to be 0.98 for the mandible and 0.89 for the maxilla alveolar process.

Conclusion: Automatic segmentation of the jaw bones is the first step of guide preparation. The findings we obtained are promising for artificial intelligence-supported guide applications.

264: IMAGING FINDINGS OF NASOPHARYNGEAL TUMORS IN PADIATRIC POPULATION

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Aim: Nasopharyngeal lesions in paediatric ages are divided mostly into non-neoplastic and neoplastic masses. The purpose of this study is to present imaging aspects encountered over a period of 2 years in a group of children with nasopharyngeal lesions.

Methods: In the last year (Jan. 2023- Jan. 2024), a total of 113 paediatric patients were addressed to „N. Oblu Emergency Hospital Iasi” for further imagistic investigation and specialised treatment having different brain diseases. We analysed 80 patients via MRI, 32 patients with computer-tomography, and we complete this study with a paediatric patient in hospital evidence for a period of 3 years.

Results: Benign adenoidal hypertrophy was identified in 12 feminine patients and 14 male patients. Only 6 male patients had fibroadenoma and only 5 cases had different sized Thornwaldt cysts. The 6-year-old patient is from 2010, when he presented after 3 repetitive cases of bacterial tonsillitis. He undergoes a CT scan that shows serous otitis associated with manifested hypertrophy of the left posterior and lateral nasopharyngeal mucosa. One year post-treatment, the CT scan identifies a pulmonary metastasis, without a genuine intracranial extension of the primary lesion.

Conclusion: Nasopharyngeal carcinomas are rarely suspected clinically and imaging wise in a young patient. It is a must to promptly and efficiently examine the key radiological elements of the nasopharyngeal mucosa changes in a patient with repetitive otitis and epistaxis for early diagnosis and timely appropriated therapy.

265: DRAMATIC BONE LESION WITH MINOR RADIOGRAPHIC FEATURES IN 2D IMAGING

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Aim: We present an extensive right maxillary lesion with subtle radiographic features.

Case presentation: A 51-year-old man, otherwise healthy, presented with a one-month swelling in his right jaw, which did not improve following root canal treatment of the 1st and 2nd molars, thus he was referred to our tertiary center. Periapical radiograph demonstrated disappearance of the lamina dura in the periapical region of the adjacent teeth. Panoramic image demonstrated a lesion with subtle cortical borders causing opacification of the right maxillary sinus, resembling pneumatization. CBCT scan revealed an extensive maxillary lesion causing antral expansion and effacement of the nasal, antral and orbital borders. Histopathologic diagnosed the lesion as adenoid cystic carcinoma with perineural invasion. Treatment included surgical maxillectomy and neck dissection, followed by external radiation.

Conclusion: Radiographic changes causing asymmetry of anatomical structures should serve as an alarming sign in order to diagnose pathological lesions in their initial stages.

267: ADVANCEMENTS IN ORBITAL DEFECT RECONSTRUCTION PLANNING: A STATISTICAL SHAPE MODEL APPROACH OUTPERFORMS TRADITIONAL MIRRORING METHODS

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Aim: Traditional methods for reconstructing orbital bone defects rely on manual mirroring techniques, which are time-consuming and subject to variability based on the expertise of the surgical planner. This study aims to introduce a novel approach utilizing a statistical shape model (SSM) for automated and precise orbital defect reconstruction.

Material and Methods: A SSM was constructed in open-source Scalismo software, using computed tomography (CT) scans from sixty-five healthy midfaces to capture the shape variations of the orbital region. Parameter optimization and clinical validation were conducted on an additional fifteen CT scans. Orbital defects, ranging in size from large to small and occurring both unilaterally and bilaterally, were simulated within orbital floor and medial wall regions. The reconstruction error for these defects was then compared between the SSM-based reconstruction and the traditional mirroring method.

Results: The SSM-based reconstruction method achieved median reconstruction errors of 0.26mm for small and 0.35mm for large unilateral defects, as well as 0.32mm for small and 0.38mm for large bilateral defects. These results outperformed those of the mirroring method, which yielded a reconstruction error of 0.48mm for small and 0.51mm for large unilateral defects. Notably, the mirroring method was found to be inaccurate for bilateral defects. The SSM-based reconstruction had a mean processing time of 2±2mins. In contrast, experienced engineers spent an average of 25±11mins.

Conclusion: SSM-based reconstruction offers superior accuracy and efficiency compared to mirroring techniques, especially for bilateral defects. These findings highlight the potential of SSM-based reconstruction to revolutionize patient-specific implant design protocols.

268: BILATERAL VESSEL-OUTLINING CAROTID ARTERY CALCIFICATIONS IN PANORAMIC RADIOGRAPHS - STRONGER INDICATOR FOR RISK OF VASCULAR EVENTS THAN PLAQUEAREA

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Aim: Carotid artery calcification (CAC) can incidentally be identified in panoramic radiographs (PR). Bilateral vessel-outlining (BVO) CACs represent a specific feature of CAC and constitute an independent risk marker for future vascular events. We aimed to investigate the correlation between BVO CACs and vascular events, as well as their association to carotid ultrasound plaque area.

Material and method: We prospectively enrolled 212 consecutive participants with PR-detected CACs, performed for dental purposes. BVO CACs were identified in 43/212 (20%) participants and ultrasound was utilized to assess plaque area at baseline. The primary outcome was the occurrence of major adverse cardiovascular events (MACE) during the follow-up period, including transient ischemic attack, stroke, angina pectoris, myocardial infarction, heart failure, revascularization, peripheral artery disease, and vascular death.

Results: Vessel-outlining CAC was significantly associated with larger plaque area on the same side ($p<0.05$) and BVO CACs were associated with larger total plaque area compared to other CAC features ($p<0.01$). Mean follow-up was 7.0 years and one third of the participants had more than one MACE. In bivariable analyses, both BVO CACs (HR 2.5, $p<0.001$) and total plaque area (HR 1.8 per cm^2 , $p<0.01$) were associated with MACE. When entering BVO CACs, plaque area and other relevant co-variables in a multivariable model, BVO CACs were close to unchanged, whereas total plaque area was no longer significant (HR 1.0, $p>0.9$).

Conclusion: The present results point to that BVO CACs is a stronger predictor for future MACE than plaque area.