

# DENTAL AGE ESTIMATION OF LIVING PERSONS: COMPARISON OF DENTAL MRI WITH CONVENTIONAL ORTHOPANTOMOGRAM

Pia Baumann\*, Thomas Widek, Heiko Merkens, Julian Boldt, Andreas Petrovic, Martin Urschler, Barbara Kirnbauer, Norbert Jakse, Eva Scheurer

\* Resident and Researcher at the Ludwig Boltzmann Institute for Clinical Forensic Imaging, Graz, Austria, till 2012 - Currently resident at the University Centre of Legal Medicine, Geneva-Lausanne, Switzerland.

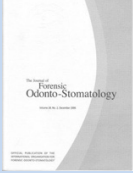
The authors declare that they have no conflict of interest.

***Introduction:*** In the last years the need for forensic age estimations in living adolescents increased with migration, particularly from countries where birth dates are not reliably documented. To date, the gold standard of dental age estimation is to evaluate the mineralization and eruption stages of the third molars using an orthopantomogram (OPG). Based on published reference values, the stages are converted in an age estimate in years. However, the use of ionizing radiation without medical indication is ethically controversial and not permitted in many countries. Thus, the aim of this study was to investigate if dental MRI can be used for the assessment of dental age with equally good results as when using an OPG.

***Methods:*** 27 healthy volunteers (19♀, 8♂, age range 13.56-23.11y, median 18.92) with at least two present third molars underwent an MRI scan of the jaw within 14 days after a clinically indicated OPG. The examinations were performed on a 3T Magnetom scanner (Tim Trio, Siemens AG, Erlangen, Germany) using an 8-channel receive-only CPC coil (Noras MRI products GmbH, Hoechberg, Germany). The protocol consisted of a 3D TSE and a 3D CISS sequence. Mineralization and eruption stages of all present molars were independently analyzed on OPGs and MR images by two blinded dentists according to the staging system established by Demirjian and Mincer. Pooled data were used to correlate the results and linear regression was performed. Cohen's Kappa was determined to assess inter-rater agreement.

***Results:*** Out of 312 present molars, 22 teeth had to be excluded from further analysis due to technical reasons. Thus, 290 molars were finally evaluated. The developmental stages could well be differentiated in MRI. The stages found in the OPGs correlated linearly with those in MRI. While mineralization in MRI tended to be associated with stages up to 3 stages higher than in the OPG (linear regression:  $y=0.83x+1.22$ ,  $R=0.79$ ), eruption showed an almost perfect correlation between both methods ( $y=1.05x-0.26$ ,  $R=0.94$ ). The evaluation of the Bland Altman Plot showed a mean of -0.003 and a 95% confidence interval (CI) for mineralization of -1 to 1, and for eruption a mean of 0.076 and a 95% (CI) of -0.5 – 0.6. Inter-rater agreement was moderate for mineralization (OPG  $\kappa=0.46$ , MRI  $\kappa=0.52$ ) and good regarding eruption (OPG  $\kappa=0.76$ , MRI  $\kappa=0.57$ ).

***Conclusion:*** The comparison of dental MRI with the OPG demonstrates that there is a good correlation between both imaging methods. Reasons for the observed differences for mineralization might be that there exist more stages for mineralization than for eruption. Although more data is needed for statistical validation, these results could be the first step towards a replacement of the OPG by MRI.



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**KEYWORDS:** Forensic Odontology, Dental Age Estimation, Dental MRI, Orthopantomogram.

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