G8 Root Pulp Visibility (RPV): A Reliable Mandibular Maturity Marker (MMM) to Determine a Subject's Status at the 18-Year Threshold

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After attending this presentation, attendees will be aware of the use of RPV as an MMM to predict whether or not a subject of unknown date of birth is below or above the 18-year age threshold and will be able to apply assessment of RPV to cases that are presented for their consideration.

This presentation will impact the forensic science community by illustrating that the differentiation between RPV-A and RPV-B compared to RPV-C and RPV-D will enable assessors to predict with 100% reliability whether or not a subject is more than 18 years old.

Introduction: The potential for using the gradual disappearance of the root pulp of lower third molars as a marker to indicate an age above 18 years was first published in 2010 by Olze et al.[1] This approach was subsequently tested on a large group of subjects in England to provide a reference data set for United Kingdom Caucasians.[2] The high concordance of the results from these two studies led to the introduction of the RPV assessment for cases of forensic age estimation. As a consequence of this development, it was deemed appropriate to revisit the Dental Age Estimation (DAE) cases carried out by the Dental Age Research London Information Group (DARLInG) team.

Materials and Methods: All DAE cases from 2005 to 2015 were re-examined to determine the applicability of the RPV assessment when predicting whether subjects were above or below the 18-year threshold. A cascade of filters was applied to the data held on DAE cases including the presence of Stage H for LL8 (Fédération Dentaire Internationale (FDI) 38; if the LL8 was absent but the LR8 was present, LR8 was used as an alternate). When LL8 Stage H was present (or LR8H as an alternate), RPV was assessed using combined criteria[1,2] This enabled calculation of the probability of a subject being more than 18 years of age.

Females	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**n - tds for RPV Stages in females**
RPV-Af	21.44	2.03	0.966	96.6	4
RPV-Bf	22.10	2.03	0.990	99.0	22
RPV-Cf	23.64	1.58	1.000	**100.0**	9
RPV-Df	23.84	1.38	1.000	**100.0**	1
Males	**(years)**	**sd**	**p > 18 years**	**%-age > 18 years**	**n - tds for RPV Stages in males**
RPV-Am	21.27	2.05	0.977	97.7	40
RPV-Bm	22.61	2.15	0.993	99.3	87
RPV-Cm	23.34	1.98	1.000	**100.0**	26
RPV-Dm	23.46	1.67	1.000	**100.0**	2

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Results: From the total of 410 forensic age assessments, there were 191 subjects with tooth 38 (FDI; the lower left third molar) at Stage H, which is completion of root development. Where appropriate, tooth 48 was substituted.

Using conventional probability estimates confined to the final stage of development of LL8H, the following probabilities that the subject is more than 18 years were derived for both sexes: (1) in females, tooth 38 (LL8Hf), the probability that the subject was more than 18 years was 0.867 (86.7%); (2) in males, tooth 38 (LL8Hm), the probability that the subject was more than 18 years was 0.750 (75.0%); and, (3) the probabilities of a subject being more than 18 years using RPV are shown in the table. For both female and male subjects with RPV-C and RPV-D, the probability of being more than 18 years is 1.000 (100%).[3]

Discussion: The presence of RPV-C and RPV-D is a clear indicator that the subject is more than 18 years old. For RPV-A and RPV-B, there is a small probability that the subject is less than 18 years old. The MMM are limited to subjects for whom the LL8 (or LR8) are present on the dental panoramic tomograph.

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

Reference(s):

1. Olze A., Solheim T., Schulz R., Kupfer M., Schmeling A. Evaluation of the radiographic visibility of the root pulp in the lower third molar for the purposes of forensic age estimation in living individuals. *International Journal of Legal Medicine.* 2010; 124: 183-186.
2. Lucas V.S., McDonald F., Roberts G. Dental Age Estimation: Root Pulp Visibility (RPV) and Periodontal Ligament Visibility (PLV) at the 18-Year threshold. Abstract G5. *Proceedings of the American Academy of Forensic Sciences*, 68th Annual Scientific Meeting, Las Vegas, NV. 2016.
3. www.dentalage.co.uk. See section Reference Data Sets.

Root, Pulp, Visibility

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