G27   Root Pulp Visibility (RPV): Validation of Applicability of RPV in Determining Adult Status

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After attending this presentation, attendees will be aware of the applicability of RPV measurements to predict whether or not a subject of unknown date of birth is above the 18-year threshold, will be able to apply RPV to cases in which the lower third molar has completed growth and mineralization, and estimate with a high level of probability if the individual is above 18 years of age.

This presentation will impact the forensic science community by providing a method with great potential to predict the adult status of subjects without birth records.

Introduction: The gradual loss of RPV with increasing age has been reported in the European literature.[1,2] This enables a reliable prediction of the age above the 18-year threshold. To validate the technique, the first stage is collection and publication of reference data.[1,2] Next, Dental Panoramic Tomographs (DPTs) of subjects of known age are assessed (age and gender masked).

The purpose of this study is to assess the reliability of RPV in predicting whether a subject is below or above the 18-year threshold. In the United Kingdom, 18 years is the age of majority (i.e., adult status).

Materials and Methods: DPTs taken early in 2015 were drawn from the archives of Guy's and St. Thomas' hospitals. The inclusion criteria were DPTs of diagnostic quality of both male and female subjects of known ancestry, aged between 16 and 25.9 years. The DPTs were enlarged to X2 to improve visualization. The lower left third molar (LL8) was assessed to predict maturity using the 8 Stage System of development.[3]

For each LL8 Stage H, RPV was recorded using the original criteria, modified to improve interpretation.[1,2] The assessments were made in random order. The age, gender, and ancestry were not known to the assessor. Intra-rater agreement was determined by randomly selecting 10% of the subjects for reassessment one week later. All data was entered into a Microsoft® Excel® spreadsheet, and a filter process was applied to isolate the data for each of the RPV categories by gender.

Results: A total of 396 DPTs were assessed. The proportion of subjects in each RPV category is shown in the table below.

Root Pulp Visibility: Summary Statistics for Stages A, B, C, D						
			$\overline{x}$	SD	p > 18	% > 18
RPV- •f	59 / 238	24.8%	19.96	2.99	0.74	74.0
RPV- Af	42 / 238	17.6%	22.45	2.22	0.98	98.0
RPV- Bf	103 / 238	43.3%	23.52	1.68	1.00	100
RPV- Cf	31 / 238	13.0%	23.83	1.85	1.00	100
RPV- Df	3 / 238	1.3%	23.49	0.15	1.00	100
			$\overline{x}$	SD	p > 18	% > 18
RPV- •m	45 / 157	29.3%	19.04	2.74	0.65	65.0
RPV- Am	19 / 157	12.1%	21.60	2.79	0.14	90.2
RPV- Bm	71 / 157	45.2%	22.53	2.34	0.97	97.0
RPV- Cm	20 / 157	12.7%	24.44	2.02	1.0	100
RPV- Dm	2 / 157	1.3%	24.85	1.25	1.0	100

• signifies unusable data from DPTs.   f = female, m = male

Discussion: This validation of RPV using the gold standard of chronological age has demonstrated a high level of reliability for predicting the adult status of a subject. Clearly, it is appropriate to apply these findings to individuals without birth records. It appears that the high level of probability of being aged above the 18-year threshold is greater than shown in the original studies.[1,2]

Conclusions: The use of RPV has great potential for predicting adult status for subjects without birth records.

Reference(s):

1. Olze A., Solheim T., Schulz R., Kupfer M., Schmeling A. Evaluation of radiographic visibility of the root pulp in lower third molars for the purpose of forensic age estimation in living individuals. *International Journal of Legal Medicine.* 2010; 124: 183-186.
2. Lucas V.S., McDonald F.M., Andiappan M., Roberts G. Dental age estimation – Root pulp visibility (RPV) patterns: A reliable mandibular maturity marker at the 18 year threshold. *Forensic Science International.* 2017; 270: 98-102.
3. Demirjian A., Goldstein H., Tanner J.M. A New System of Dental Age Assessment. *Human Biology.* 1973; 45(2): 211-227.

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